IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT EXAMINING OPERATION

Inventor: Eric Wickstrom et al.

Serial No: 10/688,821	Group Art Unit: 1633
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Attorney Docket No.: W1133/20008	Confirmation No.: 2530

For: COMPOUNDS AND METHODS FOR DIAGNOSTIC IMAGING AND THERAPY

DECLARATION UNDER 37 C.F.R. § 1.132

Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
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Sir:

I, Eric Wickstrom, Ph. D., a citizen of the United States of America, hereby declare and state:

1. The resume attached as Exhibit A accurately reflects my professional credentials.

2. I am a co-inventor of the subject matter described and claimed in the present application.

3. I have reviewed the application and its prosecution history including the Advisory Office Action of April 19, 2007.

4. I understand from my review of the Office Action of November 14, 2006 that claims of the present application were rejected under 35 U.S.C. 103 as obvious over Tomalia et al. (U. S. Patent No. 5,714,166) in view of Meade et al. (US Patent No. 6,713,046). I understand from my attorneys that in order to establish obviousness, (1) there must be some suggestion of motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or reference when combined) must teach or suggest all the claim limitations. Also, I am informed that certain factors are relevant to obviousness rejections, including evidence of unexpected results.

5. The Examiner acknowledged on page 6 of the Office Action dated March 14, 2007 that "Tomalia et al. do not teach the specific arrangement recited in the instant claims, i.e., X-L1-P-L2-T. However, as stated above, Tomalia et al. teach all components necessary for this arrangement." I believe that for the component at issue, it is not enough to disclose single units forming the component. The order of functional units in the compound of the inventionX-L1-P-

L2-T is vital to the purpose of entering a cell and binding to a nucleic acid target. As stated on page 5 of the specification:

> It has now been discovered that a compound comprising a diagnostic or therapeutic moiety can be retained inside a cell by conjugating the moiety to at least one PNA that is targeted to the transcripts from one or more genes of interest. The diagnostic or therapeutic moiety is also conjugated to at least one targeting moiety specific for an extracellular receptor or other cell surface molecule. The targeting moiety binds to the surface of a cell, and the entire compound is then internalized. Once inside the cell, the PNA portion of the diagnostic or therapeutic compound binds to RNA transcripts in a sequence specific manner. Binding of the PNA to its target RNA transcript retains the compound within the cell. The PNA can be designed to bind to a predetermined nucleic acid sequence from an RNA transcript, for example a mutated or overexpressed sequence that is characteristic of a pathological state.

The compound $(T)_e*(P)_x*(M)_y$ taught by Tomalia et al. functions contrarily to the compound of the present invention, where it permits compound binding to multiple neighboring cells via multiple T2 interactions on the surface of the dendrimer P, preventing internalization of the compound into a single targeted cell, which in turn will prevent T1 binding to the targeted nucleic acid inside the cell.

Thus, the compound taught by Tomalia et al. fails to teach or suggest the compound of the invention. The Examiner relies on a secondary reference Meade et al for the use of Gd(III) as a contrast agent for MRI. However, the secondary reference Meade et al. does not remedy the aforementioned deficiency of the primary reference, the Tomalia et al. reference, to teach or suggest all the limitations of the base claim 1. The combination proposed by the Examiner requires the eradication of the intended function of the references. There is nothing obvious about combining references for what they do not teach. A person skilled in the art would not be motivated to employ the Tomalia compound to bind to a surface of a cell for further internalization by consequent binding of the PNA portion of the diagnostic or therapeutic compound to RNA transcripts in a sequence specific manner.

6. I understand from my review of the Office Action of November 14, 2006 that claims of the present application were rejected under 35 U.S.C. 103 as obvious over Lewis et al.

(2002) in view of Liang et al. (Molecular Therapy, 2000, 3:236-243), as evidenced by Basu et al. (1997).

7. The Examiner acknowledged that Lewis et al. "do not teach a targeting moiety capable of binding to a cell surface molecule (claim 1)" (see pages 7 and 8 of the Office Action). Interestingly, Sun et al. MicroPET imaging of MCF-7 tumors in mice via unr mRNA-targeted peptide nucleic acids. *Bioconjug Chem.* Mar-Apr 2005;16(2):294-305, reported an attempt to image *UNR* mRNA in human MCF7 xenografts using DO3A-Tyr-PNA-Lys_4 conjugates, a structure used previously by Lewis, et al. However, sequence-specific tumor images were not observed. The four-lysine tail at the carboxy terminus of the conjugates enabled universal cell permeation. The lack of specific tumor contrast was ascribed by the authors to uptake of the [^{64}Cu]PNA-Lys_4 conjugates into all cells, so that murine *unr* mRNA with the same target sequence as human *UNR* mRNA might have contributed to PET image intensities in all tissues.

8. The Liang et al. reference is relied upon to remedy the deficiency of Lewis et al. to teach the targeting moiety. Liang et al. teach construction of a transferrin-PNA conjugate associated with a plasmid DNA vector for the purpose of plasmid DNA vector delivery into cells to effect gene therapy. It is important that Liang et al. reported no cellular uptake of the transferrin-PNA:DNA conjugate until cationic polymer polyethyleneimine, associated with a plasmid DNA vector was added. Liang et al. reported enhanced vector-encoded enzymatic activity in transfected cells if transferrin-PNA was associated with the plasmid DNA vector:polyethyleneimine complex. Therefore Liang et al. provide no motivation toward the design of the present diagnostic compound without using polyethyleneimine. The toxicity of polyethyleneimine, however, teaches away from utilizing Liang et al. construct in a human. Additionally, the construct of Liang et al. lacks the specificity provided by the present invention. Transferrin is so large, its binding to its receptor is so strong, and the transferrin receptor is so ubiquitous, that all cells would take up transferrin and any other moiety conjugated to it, regardless of the presence or absence of the target nucleic acid in a cell.

9. I believe that knowledge of our invention did not exist in the prior art as the references combined by the Examiner do not disclose the problem or its source as described in the specification starting page 2, line 7 and continuing to page 4, line 25. Further, following the

cited references, one of ordinary skill in the art would have lacked motivation to use this reference to make the composition of the present invention with a reasonable expectation of success because such motivation is not present in these references; the motivation cannot be "borrowed" from current invention. The invention is directed to "methods and compounds that allow the non-invasive and effective detection of gene expression *in vivo* in a chosen cell, where the gene expression is detected with high specificity and sensitivity. The compounds should be stable, non-toxic, and should not cause degradation of mRNA expressed from the gene of interest" (page 4, lines 19-23 of the specification). Absent such reasonable motivation, the present invention would not have been obvious to a person of ordinary skill in the art in light of the references cited by the Examiner.

10. Even if the prior art creates a presumption that the present development is obvious, the Applicants have achieved surprising results which overcome this presumption. For example, we bonded an IGF1 peptide analog to the C-terminus of the chelator-PNA hybridization probes. Our successes in radioimaging of cancer gene mRNAs in breast cancer xenografts [Tian X, Aruva MR, Qin W, et al. External imaging of CCND1 cancer gene activity in experimental human breast cancer xenografts with ^{99m}Tc-peptide-peptide nucleic acid-peptide chimeras. *Journal of Nuclear Medicine.* Dec 2004;45(12):2070-2082; Tian X, Aruva MR, Qin W, et al. Noninvasive molecular imaging of *MYC* mRNA expression in human breast cancer xenografts with a [^{99m}Tc]peptide-peptide nucleic acid-peptide chimera. *Bioconjugate Chemistry.* 2005;16(1):70-79] and in pancreas cancer xenografts [Chakrabarti, A., Aruva, M. R., Sajankila, S. P., Thakur, M. L., and Wickstrom, E. (2005) Synthesis of novel PNA-peptide chimera for non-invasive imaging of cancer. *Nucleosides, Nucleotides, and Nucleic Acids* 24:409-414; Chakrabarti, A., Zhang, K., Aruva, M.R., Cardi, C.A., Opitz, A.W., Wagner, N.J., Thakur, M.L., and Wickstrom, E. (2007) *KRAS* mRNA expression in human pancreatic cancer xenografts imaged externally with [^{64}Cu]DO3A-peptide nucleic acid-peptide chimeras. *Cancer Biology & Therapy* 6(6): in press] resulted from our design of dual-specificity hybridization probes that required receptor-specific uptake, followed by mRNA-specific hybridization and retention in cancer cells. Others skilled in the art did not anticipate our design, so that our positive results were unexpected.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: 14 May 07

Eric Wickstrom

Eric Wickstrom, Ph. D.

EXHIBIT A

CURRICULUM VITAE: **Eric Wickstrom, Ph.D.**

I. PERSONAL DATA

Title: Professor of Biochemistry & Molecular Biology

Research Interests: Genetic cancer sensing, imaging, and therapy; antibiotics bonded to medical implants

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II. EDUCATION

1964-1968: Bachelor of Sciences with Honor, Biology, California Institute of Technology, Pasadena, California mentor: Dr. Jerome Vinograd

1968-1972: Doctor of Philosophy, Chemistry, University of California, Berkeley, California mentor: Dr. Ignacio Tinoco

1973-1974: Research Associate, Chemistry, and Molecular, Cellular, and Developmental Biology, University of Colorado, Boulder, Colorado mentor: Dr. Michael Yarus

III. EXPERIENCE

1974-1981: Assistant Professor of Chemistry, University of Denver, Denver, Colorado

1981-1982: Senior Research Scientist, Recombinant DNA Division, Southern Biotech, Inc., Tampa, Florida

1982-1983: Visiting Associate Professor of Chemistry, University of South Florida, Tampa, Florida

1983-1986: Assistant Professor of Chemistry, University of South Florida

1986-1992: Coordinator, Biochemistry Division, Department of Chemistry, University of South Florida

1986-1987: Assistant Professor of Chemistry, Biochemistry, and Surgery, University of South Florida

1987-1991: Associate Professor of Chemistry, Biochemistry & Molecular Biology, and Surgery, University of South Florida

1988-1992: Member, Institute for Biomolecular Science, University of South Florida

1991-1992: Professor of Chemistry, Biochemistry & Molecular Biology, and Surgery, University of South Florida

1992-1996: Professor of Pharmacology; Member, Jefferson Cancer Institute, Jefferson Medical College, Thomas Jefferson University, Philadelphia, Pennsylvania

1997-2002: Professor of Microbiology & Immunology; Member, Kimmel Cancer Center; Member, Cardeza Foundation for Hematologic Research, Jefferson Medical College, Thomas Jefferson University

2002-2005: Professor of Biochemistry & Molecular Pharmacology; Member, Kimmel Cancer Center; Member, Cardeza Foundation for Hematologic Research, Jefferson Medical College, Thomas Jefferson University

2005-present: Professor of Biochemistry & Molecular Biology; Member, Kimmel Cancer Center; Member, Cardeza Foundation for Hematologic Research, Jefferson Medical College, Thomas Jefferson University

IV. BOOKS

1. Wickstrom, E., ed. (1998) *Clinical Trials of Genetic Therapy with Antisense DNA and DNA Vectors*, Marcel Dekker, New York, ISBN 0-8247-0085-6.
2. Wickstrom, E., ed. (1991) *Prospects for Antisense Nucleic Acid Therapy of Cancer and AIDS*, Wiley-Liss, New York, ISBN 0-471-56880-5.

V. CHAPTERS AND REVIEWS

1. Panchapakesan, B., and Wickstrom, E. (2007) Nanoscale electronic sensing of cancer cells. In Nalwa, H. S., ed., *Encyclopedia of Nanoscience and Nanotechnology*, Second Edition, American Scientific Publishers, in press.
2. Panchapakesan, B., and Wickstrom, E. (2007) Nanotechnology for sensing, imaging, and treating cancer. *Surgical Oncology Clinics of North America*, in press.
3. Tian, X., Chakrabarti, A., Amirkhanov, N., Aruva, M., Zhang, K., Cardi, C., Lai, S., Thakur, M. L., and Wickstrom, E. (2007) Receptor-mediated internalization of chelator-PNA-peptide hybridization probes for radioimaging and magnetic resonance imaging of oncogene mRNAs in tumours. *Biochemical Society Transactions* **35**(Feb):72-76.
4. Teker, K., Wickstrom, E., and Panchapakesan, B. (2006) Biomolecular tuning of electronic transport properties of carbon nanotubes via antibody functionalization. *IEEE Sensors Journal* **6**(December): 1422-1428.
5. Wickstrom, E., and Thakur, M. L. (2006) Imaging cancer gene activity in patients from outside the body. *Biotechnology Healthcare* **2**(2):45-48.
6. Wickstrom, E., Thakur, M. L., and Sauter, E. R. (2006) Radiolabeled peptide nucleic acid oncogene probes conjugated to receptor-specific peptide analogs. In Janson, C. G., and During, M. J., eds., *Peptide Nucleic Acids, Morpholinos, and Related Antisense Biomolecules*, Molecular Biology Intelligence Unit, Landes Bioscience/Kluwer Academic/Plenum Publishers, New York, Chap. 5, 59-86.
7. Efimov, V., Chakhmakhcheva, O., and Wickstrom, E. (2005) Synthesis and application of negatively charged PNA analogues. *Nucleosides, Nucleotides, and Nucleic Acids* **24**(10):1853-1874.
8. Tian, X., Chakrabarti, A., Amirkhanov, N., Aruva, M., Zhang, K., Mathew, B., Cardi, C., Qin, W., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2005) External imaging of *CCND1, MYC* and *KRAS* oncogene mRNAs with tumor-targeted radionuclide-PNA-peptide chimeras. In El-Deiry, W., ed., *Tumor Progression and Therapeutic Resistance, Annals of the New York Academy of Sciences*, **1059**:106-144.
9. Thakur, M. L., Tian, X., Amirkhanov, N., Chakrabarti, A., Aruva, M., Rao, P. S., Qin, W., Zhu, W., Sauter, E. R., and Wickstrom, E. (2004) The role of radiolabeled peptide nucleic acid chimeras and peptides in imaging oncogene expression. *Indian Journal of Nuclear Medicine* **19**(3):98-114.
10. Wickstrom, E., Choob, M., Urtishak, K. A., Tian, X., Sternheim, N., Archdeacon, J., Efimov, V.A., and Farber, S. A. (2004) Sequence specificity of alternating hydroxyprolyl/phosphono peptide nucleic acids against zebrafish embryo mRNAs. *Journal of Drug Targeting* **12**(6):363-372.
11. Wickstrom, E., Urtishak, K. A., Choob, M., Tian, X., Sternheim, N., Cross, L. M., Rubinstein, A., and Farber, S. A. (2004) Downregulation of gene expression with negatively charged peptide nucleic acids (PNAs) in zebrafish embryos. In Detrich, W., Westerfield, M., and Zon, L., eds., *Methods in Cell Biology* **77***: ZEBRAFISH: Genetics, Genomics, and Informatics*, 2nd ed., Elsevier/Academic Press, San Diego, Chap. 8, 137-158.
12. Wickstrom, E., Tian, X., Amirkhanov, N., Chakrabarti, A., Aruva, M., Rao, P. S., Thakur, M. L., Qin, W., Zhu, W., and Sauter, E. R. (2004) Radionuclide-peptide nucleic acid diagnosis and treatment of pancreatic cancer. In Phillips, M. I., ed., *Methods in Molecular Medicine* **106***: Antisense Therapeutics*, 2nd ed., Humana Press, Totowa NJ, Chap. 8, 135-192.
13. Thakur, M. L., Tian, X., Aruva, M., Qin, W., Duffy, K., Rao, P. S., Sauter, E. R., and Wickstrom, E. (2003) Imaging oncogene mRNA with Tc-99m-PNA-peptide chimeras. *Journal of Labelled Compounds and Radiopharmaceuticals* **46**:S10-S14.
14. Tian, X., Aruva, M., Rao, P. S., Qin, W., Read, P., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2003) Imaging oncogene expression. In Cho-Chung, Y. S., Gewirtz, A. M., and Stein, C. A., eds., *Therapeutic Oligonucleotides: Antisense, RNAi, Triple Helix, DNA Decoys, and DNA Chips, Annals of the New York Academy of Sciences* **1002**:165-188.
15. Wickstrom, E., Thakur, M. L., and Sauter, E. R. (2003) Receptor-specific targeting with complementary peptide nucleic acids conjugated to peptide analogs and radionuclides. *International Journal of Peptide Research and Therapeutics* **10**(3/4):191-214.

16. Wickstrom, E., Sauter, E. R., Tian, X., Rao, P. S., Quin, W., and Thakur, M. L. (2002) Radiolabeled PNAs for imaging gene expression. *Brazilian Archives of Biology and Technology* 45:57-69.
17. Wickstrom, E., Tian, X., Rao, P. S., Thakur, M. L., Qin, W., and Sauter, E. R. (2002) Oncogene mRNA imaging with Tc-99m-chelator-PNA-peptides. *Russian Chemical Bulletin, International Edition* **51**:1083-1099.
18. Wickstrom, E. (2001) Oligonucleotide treatment of *RAS*-induced tumors in nude mice. *Molecular Biotechnology* **18**:35-55.
19. Smith, J. B., and Wickstrom, E. (2000) Preclinical antisense DNA therapy of cancer in mice. In Phillips, M. I., ed., *Methods in Enzymology* **314,** *Antisense Technology*, Part B, Academic Press, Orlando FL, 537-580.
20. Wickstrom, E., ed. (1999) Special Issue - Antisense Therapeutics. In *Frontiers in Bioscience* **4,** http://www.bioscience.org/current/special/antisens.htm
21. Smith, J. B., and Wickstrom, E. (1998) Inhibition of tumorigenesis in a murine B-cell lymphoma transplant model by c-*myc* complementary oligonucleotides. In Walden, P., Treizer, U., Sterry, W., and Farzaneh, F., eds., *Cancer Gene Therapy: Proceedings of the Third European Conference on Gene Therapy of Cancer, Advances in Experimental Medicine and Biology*, Vol. 451, Plenum, New York, 17-22.
22. Wickstrom, E., and Smith, J. B. (1998) DNA combination therapy to stop tumor growth. *Cancer Journal* **4**:S43-S47.
23. Wickstrom, E., and Tyson, F. L. (1997) Differential oligonucleotide activity in cell culture versus mouse models. In Chadwick, D.J., and Cardew, G., eds., *Oligonucleotides as Therapeutic Agents*, Ciba Foundation Symposium 209, Wiley, Chichester, 124-141.
24. Wickstrom, E. (1997) Antisense c-*myc* inhibition of lymphoma growth. *Antisense and Nucleic Acid Drug Development* **7**:225-228.
25. Wickstrom, E. (1997) Antisense DNA therapy of Burkitt's lymphoma in Eμ-*myc* transgenic mice. In Weiss, B., ed., *Antisense Oligodeoxynucleotides and Antisense RNA as Novel Pharmacological and Therapeutic Agents*, CRC Press, Boca Raton FL, 149-169.
26. Lebedev, A. V., and Wickstrom, E. (1996) The chirality problem in P-substituted oligonucleotides. In Trainor, G., ed., *Perspectives in Drug Discovery and Design*, Vol. 4, ESCOM Science Publishers, Leiden, 17-40.
27. Wickstrom, E. (1996) Antisense tumor therapy: activated c-Ha-*ras* oncogene in the mouse. In Agrawal, S., ed., *Methods in Molecular Medicine* **2***: Antisense Therapeutics,* Humana Press, Totowa NJ, 87-108.
28. Wickstrom, E. (1995) Nuclease resistant derivatives of antisense DNA. In Akhtar, S., ed., *Delivery Systems for Antisense Oligonucleotide Therapeutics,* CRC Press, Boca Raton FL, 85-104.
29. Wickstrom, E. (1993) The ABCs of gene therapy. *JeffNews*, 18 May, 6.
30. Wickstrom, E. (1992) Strategies for administering targeted therapeutic oligodeoxynucleotides. *Trends in Biotechnology* **10**:281-287.
31. Wickstrom, E. (1992) Antisense DNA control of c-*myc* gene expression, proliferation and differentiation in HL-60 cells. In Murray, J. A. H., ed., *Antisense RNA and DNA*, Wiley-Liss, New York, 317-334.
32. Wickstrom, E. (1992) Antisense DNA therapeutics: neutral analogs and their stereochemistry. In Erickson, R. P., and Izant, J. G., eds., *Gene Regulation: Biology of Antisense RNA and DNA*, Raven Press, New York, 119-132.
33. Wickstrom, E., Bacon, T. A., Wickstrom, E. L., Werking, C. M., Palmiter, R. D., Brinster, R. L., and Sandgren, E. P. (1991) Antisense DNA methylphosphonates in c-*myc* transgenic mice. In Efimov, V. A., ed., *International Symposium on Synthetic Oligonucleotides: Problems and Frontiers of Practical Application*, Nucleic Acids Research Symposium Series No. 24, Oxford University Press, Oxford, 151-154.
34. Wickstrom, E. (1991) Antisense DNA treatment of HL-60 promyelocytic leukemia cells: terminal differentiation and dependence on target sequence. In Wickstrom, E., ed., *Prospects for Antisense Nucleic Acid Therapy of Cancer and AIDS*, Wiley-Liss, New York, 7-24.
35. Cook, R. M., Hudson, D., Tsou, D., Teplow, D., Wong, H., Zou, A.-Q., and Wickstrom, E. (1989) Fmoc-mediated solid phase assembly of human immunodeficiency virus *tat* protein. In Jung, G., and Bayer, E., eds., *Peptides 1988, Proceedings of the Twentieth European Peptide Symposium*, Walter de Gruyter, Berlin, 187-189.

36. Wickstrom, E., and Laing, L. G. (1988) Physical studies of initiation factor 3 binding to ribosomal RNA. In Moldave, K., and Noller, H. F., eds., *Methods in Enzymology*, Vol. 164, *Ribosomes*, Academic Press, New York, 238-258.
37. Wickstrom, E., Simonet, W. S., Medlock, K., and Ruiz-Robles, I. (1986) Complementary oligonucleotide probe of vesicular stomatitis virus matrix protein mRNA secondary structure. In Parsegian, V. A., ed., *Biophysical Discussions on Macromolecular Assembly Analyzed by Converging Structural Techniques*, Rockefeller University Press, New York, 15-17.

VI. RESEARCH PAPERS

1. Opitz, A. W., Amirkhanov, N. V., Wagner, N. J., and Wickstrom, E. (2007) Internalization and efflux of fluorescent polydiamidopropanoate dendrimer PNA-peptide chimeras in pancreas cancer cells. in preparation.
2. Yakubov, L. A., Likhacheva, A. C., Mechetina, L. V., Rogachev, V. A., Bogachev, S. S., Byborodin, S. I., Petrova, N. A., Shurdov, M. A., and Wickstrom, E. (2007) Natural human gene correction by small extracellular genomic DNA fragments. in preparation.
3. Panchapakesan, B., Cesarone, G., Lu, S., Hao, N., and Wickstrom, E. (2007) Single pancreas cancer cell sensing by electrophoretically deposited single wall carbon nanotubes with adsorbed monoclonal antibodies against IGF1 receptor. in preparation.
4. Zeiger, A. R., Chen, C., Edupuganti, O. M., and Wickstrom, E. (2007) Stability of radioiodinated vancomycin covalently bonded to Ti6Al4V alloy pins. in preparation.
5. Tian, X., Aruva, M. R., Zhang, K., Zhu, W., Thakur, M. L., and Wickstrom, E. (2007) Differences in the tissue distribution and pharmacokinetics of ^{64}Cu-labeled and ^{99m}Tc-labeled peptide nucleic acid probes for *CCND1* mRNA in immunocompromised mice bearing breast cancer xenografts. in preparation.
6. Amirkhanov, N. V., Zhang, K., Aruva, M. R., Thakur, M. L., and Wickstrom, E. (2007) (^{111}In-DO3A)$_n$-(PDAP)^m-*KRAS* PNA-peptide dendrimers for scintigraphic imaging of *KRAS* mRNA in AsPC1 pancreas cancer xenografts. in preparation.
7. Millar, H. J., Nemeth, J. A., McCabe, F. L., and Wickstrom, E. (2007) Circulating interleukin 8 as an indicator of lung cancer progesssion in an immunodeficient rat orthotopic human xenograft model. in preparation.
8. Chen, C., Zeiger, A. R., and Wickstrom, E. (2007) Bactericidal activity of extended 9-glycyl-minocycline derivatives. in preparation.
9. Davidson, W. R., McAleer, M. F., Kashi, O., Kari, G., Wickstrom, E., Dicker, A. P., and Rodeck, U. (2007) Off-target effects of the p53 inhibitor pifithrin-α related to inhibition of p73 in zebrafish embryos. in preparation.
10. Wyre, D. S., Abrams, M. T., and Wickstrom, E. (2007) Lowering *BCL2* expression with siRNA in acute lymphoblastic leukemia cells does not change glucocorticoid sensitivity. in preparation.
11. Tian, X., Michal, A., Li, P., Thakur, M. L., Waldman, S. A., and Wickstrom, E. (2007) Design, synthesis and properties of STa peptide analogs for probing guanylyl cyclase C. in preparation.
12. Shao, N., Lu, S., Wickstrom, E., and Panchapakesan, B. (2007) Integrated molecular targeting of IGF1R and Her2 surface receptors and destruction of breast cancer cells using single wall carbon nanotubes. submitted.
13. Zhang, K., Aruva, M. R., Shanthly, N., Cardi, C. A., Patel, C. A., Rattan, S., Gregory, C., Wickstrom, E., and Thakur, M. L. (2007) Vasoactive intestinal peptide (VIP) and pituitary adenylate cyclase activating peptide (PACAP) receptor specific peptide analogues for PET imaging of breast cancer: *In vitro / in vivo* evaluation. submitted.
14. Cesarone, G., Edugupanti, O. M., Chen, C., and Wickstrom, E. (2007) Insulin receptor substrate 1 knockdown in human MCF7 ER+ breast cancer cells by nuclease-resistant IRS1 siRNA conjugated to a disulfide-bridged D-peptide analog of insulin-like growth factor 1. submitted.
15. Amirkhanov, N. V., Zhang, K., Aruva, M. R., Shanthly, N., Lai, S., Dimitrov, I., Lackey, J. P., Cardi, C. A., Thakur, M. L., and Wickstrom, E. (2007) (Gd-DO3A)$_n$-(PDAP)^m-*KRAS* PNA-peptide MRI contrast enhancement in AsPC1 pancreas cancer xenografts. *Bioconjugate Chemistry*: under revision.
16. Tian, X., Aruva, M. R., Zhang, K., Cardi, C. A., Thakur, M. L., and Wickstrom, E. (2007) *In vivo* microPET imaging of *CCND1* mRNA in human MCF7 ER+ breast cancer xenografts with an oncogene-specific [^{64}Cu]DO3A-PNA-peptide radiohybridization probe. *Journal of Nuclear Medicine*: under revision.

17. Chakrabarti, A., Zhang, K., Aruva, M. R., Cardi, C. A., Opitz, A. W., Wagner, N. J., Thakur, M. L., and Wickstrom, E. (2007) *KRAS* mRNA expression in human pancreatic cancer xenografts imaged externally with [^{64}Cu]DO3A-peptide nucleic acid-peptide chimeras. *Cancer Biology & Therapy* **6**(6): in press.
18. Duffy, K. T. and Wickstrom, E. (2007) Zebrafish *tp53* knockdown extends the survival of irradiated zebrafish embryos more effectively than the p53 inhibitor pifithrin-α. *Cancer Biology & Therapy* **6**(5): in press.
19. Antoci, V., Jr., King, S. B., Jose, B., Parvizi, J., Zeiger, A. R., Wickstrom, E., Freeman, T. A., Composto, R. J., Ducheyne, P., Shapiro, I. M., Hickok, N. J., and Adams, C. S. (2007) Vancomycin covalently bonded to titanium alloy prevents bacterial colonization. *Journal of Orthopaedic Research* **25**: Epub ahead of print.
20. Edupuganti, O. P., Antoci, V., Jr., King, S. B., Jose, B., Adams, C. S., Parvizi, J., Shapiro, I. M., Zeiger, A. R., Hickok, N. J., and Wickstrom, E. (2007) Vancomycin covalently bound to Ti6Al4V pins provides longterm inhibition of *Staphylococcus aureus* colonization. *Bioorganic & Medicinal Chemistry Letters* **17**(10):2692-2696.
21. McAleer, M. F., Duffy, K. T., Davidson, W. R., Kari, G., Dicker, A. P., Rodeck, U., and Wickstrom, E. (2006) Antisense inhibition of cyclin D1 expression is equivalent to flavopiridol for radiosensitization of zebrafish embryos. *International Journal of Radiation Oncology Biology Physics* **66**(2):546–551.
22. Quadros, M. R. D., Connelly, S., Kari, C., Abrams, M. T., Wickstrom, E., and Rodeck, U. (2006) EGFR-dependent downregulation of Bim in epithelial cells requires MAPK and PKC-δ activities. *Cancer Biology and Therapy* **5**(5):498-504.
23. Cesarone, G., Garofalo, C., Abrams, M. T., Igoucheva, O., Alexeev, V., Yoon, K., Surmacz, E., and Wickstrom, E. (2006) Specific reduction of insulin receptor substrate 1 (IRS-1) expression in MCF7 cells by RNA interference enhances tamoxifen-mediated cell death. *Journal of Cellular Biochemistry* **98**(2):440-450.
24. Panchapakesan, B., Cesarone, G., Lu, S., Teker, K., and Wickstrom, E. (2005) Conductivity sensing of breast cancer cells by carbon nanotubes coated with monoclonal antibodies against IGF1 receptor. *NanoBiotechnology* **1**(4):353-360.
25. Teker, K., Sirdeshmukh, R., Sivakumar, K., Lu, S., Wickstrom, E., Wang, H.-N., Vo-Dinh, T., and Panchapakesan, B. (2005) Applications of carbon nanotubes for cancer research. *NanoBiotechnology* **1**(2):171-182.
26. Panchapakesan, B., Lu, S., Sivakumar, K., Teker, K., Cesarone, G., and Wickstrom, E. (2005) Single wall carbon nanotube nanobomb agents for killing breast cancer cells. *NanoBiotechnology* **1**(2):133-140.
27. Tian, X., Aruva, M. R., Wolfe, H. R., Qin, W., Sauter, E. R., Thakur, M. L., Waldman, S. A., and Wickstrom, E. (2005) Tumor-targeting peptide-PNA-peptide chimeras for imaging overexpressed oncogene mRNAs. *Nucleosides, Nucleotides, and Nucleic Acids* **24**(5):1085-1091.
28. Amirkhanov, N. V. and Wickstrom, E. (2005) Synthesis of novel polydiamidopropanoate dendrimer PNA-peptide chimeras for non-invasive magnetic resonance imaging of cancer. *Nucleosides Nucleotides Nucleic Acids* **24**(5-7):423-6.
29. Chakrabarti, A., Aruva, M. R., Sajankila, S. P., Thakur, M. L., and Wickstrom, E. (2005) Synthesis of novel PNA-peptide chimera for non-invasive imaging of cancer. *Nucleosides, Nucleotides, and Nucleic Acids* **24**(5):409-414.
30. Jose, B., Antoci, J., V., Zeiger, A. R., Wickstrom, E., and Hickok, N. J. (2005) Vancomycin covalently bonded to titanium beads kills *Staphylococcus aureus*. *Chemistry & Biology* **12**(9):1041-1048.
31. Duffy, K. T., McAleer, M. F., Davidson, W. R., Kari, L., Kari, C., Liu, C.-G., Farber, S. A., Cheng, K. C., Mest, J. R., Wickstrom, E., Dicker, A. P., and Rodeck, U. (2005) Coordinate control of cell cycle regulatory genes in zebrafish development tested by cyclin D1 knockdown with morpholino phosphorodiamidates and hydroxyprolyl-phosphono peptide nucleic acids. *Nucleic Acids Research* **33**(15):4914-4921.
32. Abrams, M. T., Robertson, N. M., Litwack, G., and Wickstrom, E. (2005) Evaluation of glucocorticoid sensitivity in 697 pre-B acute lymphoblastic leukemia cells after overexpression or silencing of MAP kinase phosphatase-1. *Journal of Cancer Research and Clinical Oncology* **131**(6):347-354.
33. Tian, X., Aruva, M. R., Qin, W., Zhu, W., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2005) Noninvasive molecular imaging of *MYC* mRNA expression in human breast cancer xenografts with a [^{99m}Tc]peptide-peptide nucleic acid-peptide chimera. *Bioconjugate Chemistry* **16**(1):70-79.

34. Abrams, M. T., Robertson, N. M., Yoon, K., and Wickstrom, E. (2004) Inhibition of glucocorticoid-induced apoptosis by targeting the major splice variants of BIM with siRNA and shRNA. *Journal of Biological Chemistry* **279**(53):55809-55817.
35. Tian, X., Aruva, M. R., Qin, W., Zhu, W., Duffy, K. T., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2004) External imaging of CCND1 cancer gene activity in experimental human breast cancer xenografts with ^{99m}Tc-peptide-peptide nucleic acid-peptide chimeras. *Journal of Nuclear Medicine* **45**(12):2070-2082.
36. Parvizi, J., Wickstrom, E., Zeiger, A. R., Adams, C. S., Shapiro, I. M., Purtill, J. J., Sharkey, P. F., Hozack, W. J., Rothman, R. H., and Hickok, N. J. (2004) Titanium surface with biologic activity against infection. *Clinical Orthopaedics and Related Research* **429**:33-8.
37. Hargis, M. T., Storck, C. W., Wickstrom, E., Yakubov, L. A., Leeper, D. B., and Coss, R. A. (2004) Hsp27 antisense oligonucleotides sensitize the microtubular cytoskeleton of Chinese hamster ovary cells grown at low pH to 42°C-induced reorganization. *International Journal of Hyperthermia* **20**(5):491-502.
38. Thakur, M. L., Aruva, M. R., Gariepy, J., Acton, P., Rattan, S., Prasad, S., Wickstrom, E., and Alavi, A. (2004) PET imaging of oncogene overexpression using ^{64}Cu-vasoactive intestinal peptide (VIP) analog: comparison with ^{99m}Tc-VIP analog. *Journal of Nuclear Medicine* **45**(8):1381-1389.
39. Chakrabarti, A., Desai, P., and Wickstrom, E. (2004) Transposon Tn7 protein TnsD binding to *Escherichia coli attTn7* DNA and its eukaryotic orthologs. *Biochemistry* **43**:2941-2946.
40. Vorobjev, P. E., Smith, J. B., Pyshnaya, I. A., Levina, A. S., Zarytova, V. F., and Wickstrom, E. (2003) Site-specific cleavage of RNA and DNA by complementary DNA-bleomycin A5 conjugates. *Bioconjugate Chemistry* **14**(6):1307-1313.
41. Urtishak, K. A., Choob, M., Tian, X., Sternheim, N., Talbot, W. S., Wickstrom, E., and Farber, S. A. (2003) Targeted gene knockdown in zebrafish using negatively charged peptide nucleic acid mimics. *Developmental Dynamics* **228**(November):405-413.
42. Butz, J., Wickstrom, E., and Edwards, J. (2003) Characterization of mutations and loss of heterozygosity of p53 and *KRAS2* in pancreatic cancer cell lines by immobilized polymerase chain reaction. *BMC Biotechnology* **3**(1):11.
43. Rao, P. S., Tian, X., Qin, W., Aruva, M. R., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2003) ^{99m}Tc-peptide-peptide nucleic acid probes for imaging oncogene mRNAs in tumours. *Nuclear Medicine Communications* **24**(8):857-863.
44. Tian, X. and Wickstrom, E. (2002) Continuous solid-phase synthesis and disulfide cyclization of peptide-PNA-peptide chimeras. *Organic Letters* **4**(23):4013-4016.
45. Vorobjev, P. E., Pyshnaya, I. A., Wickstrom, E., and Zarytova, V. F. (2002) Directed cleavage of RNA within an imperfect complementary complex by conjugates of bleomycin A5 with oligonucleotide. *Russian Chemical Bulletin, International Edition* **51**:1187-1189.
46. Vorobjev, P. E., Pyshnyi, D. V., Wickstrom, E., and Zarytova, V. F. (2002) Cleavage of RNA in hybrid duplexes by *E. coli* ribonuclease H: III. Substrate properties of RNA duplex complexes with oligodeoxyribonucleotides containing a bleomycin A5 residue. *Russian Journal of Bioorganic Chemistry* **28**:300-307.
47. Lesnikowski, Z. J., Przepiorkiewicz, M., Tamura, Y., Kaji, H., and Wickstrom, E. (2001) P-chiral oligonucleotides. Effect of configuration at phosphorus on transport of tetra (thymidine methanephosphonate)s across organic liquid membrane. *Collection of Czechoslovak Chemical Communications* **66**(8):912-922.
48. Cleaver, S. H. and Wickstrom, E. (2000) Transposon Tn7 gene insertion into an evolutionarily conserved human homolog of *Escherichia coli attTn7*. *Gene* **254**(1-2):37-44.
49. Smith, J. B. and Wickstrom, E. (1998) Antisense c-*myc* and immunostimulatory oligonucleotide inhibition of tumorigenesis in a murine B-cell lymphoma transplant model. *Journal of the National Cancer Institute* **90**(15):1146-1154.
50. Cheng, X., DeLong, R. K., Wickstrom, E., Kligshteyn, M., Demirdji, S. H., Caruthers, M. H., and Juliano, R. L. (1997) Interactions between single-stranded DNA binding protein and oligonucleotide analogs with different backbone chemistries. *Journal of Molecular Recognition* **10**(2):101-107.

51. Gray, G. D., Townsend, R., Hayasaka, H., Korngold, R., and Wickstrom, E. (1997) Immune cell involvement in anti-c-*myc* DNA prevention of tumor formation in a mouse model of Burkitt's lymphoma. *Nucleosides and Nucleotides* **16**:1727-1730.
52. Basu, S. and Wickstrom, E. (1997) Synthesis and characterization of a peptide nucleic acid conjugated to a D-peptide analog of insulin-like growth factor 1 for increased cellular uptake. *Bioconjugate Chemistry* **8**(4):481-488.
53. Gray, G. D., Basu, S., and Wickstrom, E. (1997) Transformed and immortalized cellular uptake of oligodeoxynucleoside phosphorothioates, 3'-alkylamino oligodeoxynucleotides, 2'-O-methyl oligoribonucleotides, oligodeoxynucleoside methylphosphonates, and peptide nucleic acids. *Biochemical Pharmacology* **53**(10):1465-1476.
54. Nolting, A., DeLong, R. K., Fisher, M. H., Wickstrom, E., Pollack, G. M., Juliano, R. L., and Brouwer, K. L. (1997) Hepatic distribution and clearance of antisense oligonucleotides in the isolated perfused rat liver. *Pharmaceutical Research* **14**(4):516-521.
55. Gray, G. D. and Wickstrom, E. (1997) Rapid measurement of modified oligonucleotide levels in plasma samples with a fluorophore specific for single-stranded DNA. *Antisense and Nucleic Acid Drug Development* **7**(3):133-140.
56. Mazumder, A., Uchida, H., Neamati, N., Sunder, S., Jaworska-Maslanka, M., Wickstrom, E., Zeng, F., Jones, R. A., Mandes, R. F., Chenault, H. K., and Pommier, Y. (1997) Probing interactions between viral DNA and human immunodeficiency virus type 1 integrase using dinucleotides. *Molecular Pharmacology* **51**(4):567-575.
57. DeLong, R. K., Nolting, A., Fisher, M., Chen, Q., Wickstrom, E., Kligshteyn, M., Demirdji, S., Caruthers, M., and Juliano, R. L. (1997) Comparative pharmacokinetics, tissue distribution, and tumor accumulation of phosphorothioate, phosphorodithioate, and methylphosphonate oligonucleotides in nude mice. *Antisense and Nucleic Acid Drug Development* **7**(2):71-77.
58. Basu, S. and Wickstrom, E. (1997) Temperature and salt dependence of higher order structure formation by antisense c-*MYC* and c-*MYB* phosphorothioate oligodeoxyribonucleotides containing tetraguanylate tracts. *Nucleic Acids Research* **25**(7):1327-1332.
59. Gray, G. D. and Wickstrom, E. (1996) Evaluation of anchorage-independent proliferation in tumorigenic cells using the redox dye alamarBlue. *Biotechniques* **21**(5):780,782.
60. Fu, Z. F., Wickstrom, E., Jiang, M., Corisdeo, S., Yang, J., Dietzschold, B., and Koprowski, H. (1996) Inhibition of rabies virus infection by an oligodeoxynucleotide complementary to rabies virus genomic RNA. *Antisense and Nucleic Acid Drug Development* **6**(2):87-93.
61. Le Bec, C. and Wickstrom, E. (1996) Stereospecific Grignard activated solid phase synthesis of DNA methylphosphonate dimers. *Journal of Organic Chemistry* **61**:510-513.
62. Basu, S., Kolan, H. R., Thakur, M. L., and Wickstrom, E. (1995) Solid phase synthesis of a HYNIC-D-peptide-phosphorothioate oligodeoxynucleotide conjugate from two arms of a polyethylene glycol-polystyrene support. *Journal of Labeled Compounds and Radiopharmaceuticals* **37**:350-352.
63. Huang, Y., Snyder, R., Kligshteyn, M., and Wickstrom, E. (1995) Prevention of tumor formation in a mouse model of Burkitt's lymphoma by 6 weeks of treatment with anti-c-*myc* DNA phosphorothioate. *Molecular Medicine* **1**(6):647-658.
64. Basu, S. and Wickstrom, E. (1995) Solid phase synthesis of a D-peptide-phosphorothioate oligodeoxynucleotide conjugate from two arms of a polyethylene glycol-polystyrene support. *Tetrahedron Letters* **36**:4943-4946.
65. Hughes, J. A., Avrutskaya, A. V., Brouwer, K. L., Wickstrom, E., and Juliano, R. L. (1995) Radiolabeling of methylphosphonate and phosphorothioate oligonucleotides and evaluation of their transport in everted rat jejunum sacs. *Pharmaceutical Research* **12**(6):817-824.
66. Le Bec, C. and Wickstrom, E. (1994) Stereospecific Grignard activated coupling of a deoxynucleoside methylphosphonate on a polyethylene glycol support in solution. *Tetrahedron Letters* **35**:9525-9528.
67. Vyazovkina, E. V., Savchenko, E. V., Lokhov, S. G., Engels, J. W., Wickstrom, E., and Lebedev, A. V. (1994) Synthesis of specific diastereomers of a DNA methylphosphonate heptamer, d(CpCpApApApCpA), and stability of base pairing with the normal DNA octamer d(TPGPTPTPTPGPGPC). *Nucleic Acids Research* **22**(12):2404-2409.

68. Vyazovkina, E. V., Rife, J. P., Lebedev, A. V., and Wickstrom, E. (1993) Preparation of trimers and tetramers of mixed sequence oligodeoxynucleoside methylphosphonates and assignment of configurations at the chiral phosphorus. *Nucleic Acids Research* **21**(25):5957-5963.
69. Gray, G. D., Hernandez, O. M., Hebel, D., Root, M., Pow-Sang, J. M., and Wickstrom, E. (1993) Antisense DNA inhibition of tumor growth induced by c-Ha-*RAS* oncogene in nude mice. *Cancer Research* **53**(3):577-580.
70. Wickstrom, E., Bacon, T. A., and Wickstrom, E. L. (1992) Down-regulation of c-Myc antigen expression in lymphocytes of Eμ-c-*myc* transgenic mice treated with anti-c-*myc* DNA methylphosphonates. *Cancer Research* **52**(24):6741-6745.
71. Ho, P. T., Ishiguro, K., Wickstrom, E., and Sartorelli, A. C. (1991) Non-sequence-specific inhibition of transferrin receptor expression in HL-60 leukemia cells by phosphorothioate oligodeoxynucleotides. *Antisense Research & Development* **1**(4):329-342.
72. Akhtar, S., Basu, S., Wickstrom, E., and Juliano, R. L. (1991) Interactions of antisense DNA oligonucleotide analogs with phospholipid membranes (liposomes). *Nucleic Acids Research* **19**(20):5551-5559.
73. Farese, R. V., Standaert, M. L., Ishizuka, T., Yu, B., Hernandez, H., Waldron, C., Watson, J., Farese, J. P., Cooper, D. R., and Wickstrom, E. (1991) Antisense DNA downregulates protein kinase C isozymes (beta and alpha) and insulin-stimulated 2-deoxyglucose uptake in rat adipocytes. *Antisense Research & Development* **1**(1):35-42.
74. Looney, D. J., Ojwang, J. O., Harper, M. E., Wickstrom, E., and Wong-Staal, F. (1991) Inhibition of HIV-1 by deoxyribonucleotides directed against regulatory gene messages and response elements. *Journal of Cellular Biochemistry* **15**(D):36.
75. Bacon, T. A. and Wickstrom, E. (1991) Daily addition of an anti-c-*MYC* DNA oligomer induces granulocytic differentiation of human promyelocytic leukemia HL-60 cells in both serum-containing and serum-free media. *Oncogene Research* **6**(1):21-32.
76. Bacon, T. A. and Wickstrom, E. (1991) Walking along human c-*MYC* mRNA with antisense oligodeoxynucleotides: maximum efficacy at the 5' cap region. *Oncogene Research* **6**(1):13-19.
77. Lebedev, A. V., Riker, A. R., Rife, J. P., and Wickstrom, E. (1990) Separation of 5'-dimethoxytrityl-2'-deoxynucleoside-3'-O-methylphosphonamidite diastereomers by normal phase chromatography. *Tetrahedron Letters* **31**:3673-3676.
78. Daaka, Y. and Wickstrom, E. (1990) Target dependence of antisense oligodeoxynucleotide inhibition of c-Ha-Ras p21 expression and focus formation in T24-transformed NIH3T3 cells. *Oncogene Research* **5**(4):267-275.
79. Campbell, J. M., Bacon, T. A., and Wickstrom, E. (1990) Oligodeoxynucleoside phosphorothioate stability in subcellular extracts, culture media, sera and cerebrospinal fluid. *Journal of Biochemical & Biophysical Methods* **20**(3):259-267.
80. Lebedev, A. V., Rife, J. P., Seligsohn, H. W., Wenzinger, G. R., and Wickstrom, E. (1990) Stereospecific coupling reaction for internucleotide methylphosphono-5'-thioate linkage. *Tetrahedron Letters* **31**:855-858.
81. Lebedev, A. V., Wenzinger, G. R., and Wickstrom, E. (1990) A new DMAP catalyzed phosphonamidite coupling reaction for synthesis of oligodeoxynucleoside methylphosphonate derivatives. *Tetrahedron Letters* **31**:851-854.
82. Muralikrishna, P. and Wickstrom, E. (1989) *Escherichia coli* initiation factor 3 protein binding to 30S ribosomal subunits alters the accessibility of nucleotides within the conserved central region of 16S rRNA. *Biochemistry* **28**(19):7505-7510.
83. Muralikrishna, P. and Wickstrom, E. (1989) Inducible high expression of the *Escherichia coli infC* gene subcloned behind a bacteriophage T7 promoter. *Gene* **80**(2):369-374.
84. Wickstrom, E. L., Bacon, T. A., Gonzalez, A., Lyman, G. H., and Wickstrom, E. (1989) Anti-c-*MYC* DNA increases differentiation and decreases colony formation by HL-60 cells. *In Vitro Cellular & Developmental Biology* **25**(3 Pt 1):297-302.
85. Lise, L. D., Jolivet, M., Audibert, F., Fernandez, A., Wickstrom, E., Chedid, L., and Schlesinger, D. H. (1989) Role of the proline residues on the immunogenic properties of a *P. falciparum* circumsporozoite peptide linked to a carrier protein. *Peptide Research* **2**(1):114-119.

86. Bacon, T. A., Morvan, F., Rayner, B., Imbach, J. L., and Wickstrom, E. (1988) alpha-Oligodeoxynucleotide stability in serum, subcellular extracts and culture media. *Journal of Biochemical & Biophysical Methods* **16**(4):311-318.
87. Wickstrom, E. L., Bacon, T. A., Gonzalez, A., Freeman, D. L., Lyman, G. H., and Wickstrom, E. (1988) Human promyelocytic leukemia HL-60 cell proliferation and c-Myc protein expression are inhibited by an antisense pentadecadeoxynucleotide targeted against c-*MYC* mRNA. *Proceedings of the National Academy of Sciences USA* **85**(4):1028-1032.
88. Heikkila, R., Schwab, G., Wickstrom, E., Loke, S. L., Pluznik, D. H., Watt, R., and Neckers, L. M. (1987) A c-myc antisense oligodeoxynucleotide inhibits entry into S phase but not progress from G0 to G1. *Nature* **328**(6129):445-449.
89. Wickstrom, E. (1986) *Escherichia coli* ribosomal protein S1 does not protect the 49-nucleotide 3' terminal cloacin fragment of 16S rRNA from nuclease S1. *Biochimica et Biophysica Acta* **868**(4):265-269.
90. Wickstrom, E. (1986) Oligodeoxynucleotide stability in subcellular extracts and culture media. *Journal of Biochemical & Biophysical Methods* **13**(2):97-102.
91. Wickstrom, E., Heus, H. A., Haasnoot, C. A., and van Knippenberg, P. H. (1986) Circular dichroism and 500-MHz proton magnetic resonance studies of the interaction of *Escherichia coli* translational initiation factor 3 protein with the 16S ribosomal RNA 3' cloacin fragment. *Biochemistry* **25**(10):2770-2777.
92. Wickstrom, E., Simonet, W. S., Medlock, K., and Ruiz-Robles, I. (1986) Complementary oligonucleotide probe of vesicular stomatitis virus matrix protein mRNA secondary structure. *Biophysical Journal* **49**(1):15-17.
93. Wickstrom, E. (1983) Nuclease mapping of the secondary structure of the 49-nucleotide 3' terminal cloacin fragment of *Escherichia coli* 16S RNA and its interactions with initiation factor 3. *Nucleic Acids Research* **11**(7):2035-2052.
94. Parker, K. K. and Wickstrom, E. (1983) Crosslinking of *Escherichia coli* 50S ribosomal subunits with chlorambucilyl oligoprolyl phenylalanyl-tRNA molecular rulers. *Nucleic Acids Research* **11**(2):515-524.
95. Skidgel, R. A., Wickstrom, E., Kumamoto, K., and Erdös, E. G. (1981) Rapid radioassay for prolylcarboxypeptidase (angiotensinase C). *Analytical Biochemistry* **118**(1):113-9.
96. Yager, T. D., Reuben, M. A., Ainpour, P. R., and Wickstrom, E. (1981) Molecular rulers with 5 or 11 prolines intramolecularly crosslink to G45 of yeast phenylalanine tRNA. *FEBS Letters* **133**(1):59-62.
97. Wickstrom, E. (1981) Physical parameters of *Escherichia coli* translational initiation factor 3 binding to poly(A). *FEBS Letters* **128**(1):154-156.
98. Reuben, M. A., Ainpour, P. R., Hester, H. L., Neveln, V. L., and Wickstrom, E. (1981) Synthesis and intramolecular crosslinking of chlorambucilyl (prolyl)$_n$ [^{3}H]phenylalanyl-tRNA^{Phe} (yeast), n = 0, 5, 11 and 15. *Biochimica et Biophysica Acta* **654**(1):11-25.
99. Wickstrom, E., Behlen, L. S., Reuben, M. A., and Ainpour, P. R. (1981) Molecular rulers for measuring RNA structure: sites of crosslinking in chlorambucilyl-phenylalanyl-tRNA^{Phe} (yeast) and chlorambucilyl-pentadecaprolyl-phenylalanyl-tRNA^{Phe} (yeast) intramolecularly crosslinked in aqueous solution. *Proceedings of the National Academy of Sciences USA* **78**(4):2082-2085.
100. Wickstrom, E., Parker, K. K., Hursh, D. A., and Newton, R. L. (1981) Chlorambucil [^{3}H]phenylalanyl-tRNA crosslinking to 50S ribosomal subunit proteins L4, L26-27 and L18-20. *FEBS Letters* **123**(2):273-276.
101. Wickstrom, E. (1980) Chlorambucil inhibition by dimethyl sulfoxide and thiosulfate: implications for chlorambucil chemotherapy. *Medical Hypotheses* **6**(10):1035-1041.
102. Schleich, T., Wickstrom, E., Twombly, K., Schmidt, B., and Tyson, R. W. (1980) Circular dichroism study of Escherichia coli initiation factor 3 binding to nucleic acids. *Biochemistry* **19**(19):4486-92.
103. Wickstrom, E. and Mischke, C. F. (1980) Deoxynucleoside composition of DNA determined by reversed-phase LC: a student experiment. *American Laboratory* **12**(6):35-38.
104. Mischke, C. F. and Wickstrom, E. (1980) Deoxynucleoside composition of DNAs and modified nucleoside composition of tRNAs determined at nanomole sensitivity by reversed-phase liquid chromatography. *Analytical Biochemistry* **105**(1):181-187.
105. Tyson, R. W. and Wickstrom, E. (1980) Rapid purification of radiolabeled trinucleoside diphosphates by reversed-phase high-performance liquid chromatography. *Journal of Chromatography.* **192**:485-489.

106. Wickstrom, E., Tyson, R. W., Newton, G., Obert, R., and Williams, E. E. (1980) Stoichiometry of homopolynucleotide binding to *Escherichia coli* translational initiation factor 3. *Archives of Biochemistry & Biophysics* **200**(1):296-300.
107. Ainpour, P. R. and Wickstrom, E. (1980) Modifications of solid phase peptide synthesis to obtain homogeneous oligoprolines in high yield. *International Journal of Peptide & Protein Research* **15**(3):225-235.
108. Reuben, M. A., Kusnezov, I. J., and Wickstrom, E. (1979) Inhibition of deacylation and improvement in N-hydroxysuccinimide ester modification of phenylalanyl-tRNA by dimethyl sulfoxide. *Biochimica et Biophysica Acta* **565**(1):219-223.
109. Wickstrom, E. and Tinoco, I., Jr. (1974) The stability of RNA hairpin loops containing A-U-G: A_n-U-G-U_m. *Biopolymers* **13**(11):2367-2383.
110. Wickstrom, E. (1974) *Escherichia coli* initiation factor IF3 binding to AUG and AUG-containing single strands and hairpin loops, and nonspecific binding to polymers. *Biochimica et Biophysica Acta* **349**:125-130.
111. Wickstrom, E. (1971) Circular dichroism during deacylation of methionyl-$tRNA_f^{met}$ and formylmethionyl-$tRNA_f^{met}$ from *E. coli*. *Biochemical & Biophysical Research Communications* **43**(5):976-983.

VII. PATENTS

1. Wickstrom, E., and Thakur, M. L. (2003) Compounds and Methods for Diagnostic Imaging and Therapy. U.S. patent application 10/688,821.
2. Hickok, N. J., and Wickstrom, E. (2003) Advanced Biomaterials and Methods of Attaching Therapeutic Agents Thereto. U.S. patent application 10/662,261.
3. Fu, Z. F., Wickstrom, E., Dietzschold, B., and Koprowski, H. (2002) Antigenomic Oligonucleotides for Treatment of Infection by Negative-Stranded Nonsegmented RNA Viruses. U.S. patent no. 6,355,621.
4. Wickstrom, E., and Basu, S. (2001) Peptide Nucleic Acid Conjugates. U.S. patent no. 6,180,767.
5. Wickstrom, E., and Cleaver, S. H. (1999) Composition and Method for Targeted Integration into Cells. U.S. patent no. 5,958,775.
6. Wickstrom, E., and Le Bec, C. (1997) Stereospecific Solid Phase Synthesis of Oligodeoxynucleoside Alkylphosphonates by Pentavalent Grignard Coupling. U.S. patent no. 5,703,223.

VIII. RESEARCH INTERESTS

Detection, control, or suppression of oncogenes and viral genes by oligonucleotides or by nonviral vectors are the goals of this laboratory. Control of gene expression comprises the central problem of biochemistry and molecular biology. We study nucleic acid-nucleic acid and protein-nucleic acid interactions because they control replication, transcription, and translation. References are to recent publications in section VI above.

Investigators in this laboratory are currently developing oligonucleotide derivatives against oncogenes in the signal transduction pathway for use as diagnostics and therapeutics for cancers. The experimental systems being studied include the human *CCND1* oncogene, *IRS1* oncogene, *MYC* oncogene, *HER2* oncogene, *KRAS* oncogene, and *TP53* oncogene in breast cancer, ovarian cancer, pancreatic cancer, prostate cancer, colon cancer, and other solid tumors. Strongly hybridizing oligonucleotide analogs capable of surviving in the bloodstream and tissues following systemic or local administration must be synthesized and tested in animal models.

Chimeric PNA-peptides that enable receptor-mediated internalization [52] are being synthesized in order to maximize cellular uptake, nuclease resistance, and RNA hybridization, while slowing excretion. Peptides that chelate gamma-emitting ^{99m}Tc have been extended from the N-termini of peptide nucleic acids with C-terminal peptide ligands for receptor uptake [44] to permit noninvasive scintigraphic imaging of *CCND1* oncogene mRNA [16, 35] and *MYC* oncogene mRNA [16, 43] in breast cancer xenografts. Positron-emitting ^{64}Cu has been chelated to DO3A-PNA-peptides [38] for PET imaging of *CCND1* oncogene mRNA in breast cancer xenografts [5, 16], and *KRAS* mRNA in pancreas cancer xenografts [17]. Gadolinium dendrimer-peptide nucleic acid-peptide chimeras are being used for MRI imaging of *KRAS* mRNA in pancreas cancer xenografts [15, 28].

Short interfering RNA sequences have been found efficacious against *IRS1* oncogene in breast cancer cells [14, 23], and against *MKP1* [34], *BIM* [22, 34] and *BCL2* [10] oncogenes in acute lymphoblastic leukemia cells. Negatively charged phosphono peptide nucleic acid derivatives have been found more potent and specific than

morpholinos as antisense inhibitors of zebrafish embryonic developmental genes [41], and are being pursued for oncogene inhibition [31], radiosensitization [21], and radioprotection [9, 18].

Noninvasive detection of malignant cells is also being pursued with monoclonal antibodies adsorbed to single wall carbon nanotubes [3, 25, 26]. Treatment of transformed foci is being developed with single wall carbon nanotube sheets activated by laser light [26].

Infections that develop on medical implants inflict great damage, so that efforts are starting up to covalently bond therapeutics, such as oligonucleotides, peptides, or antibiotics to titanium and other implant materials, killing *Staphylococcus aureus* on contact [4, 19, 20, 30, 36].

IX. CURRENT EXTRAMURAL RESEARCH GRANTS (Career Total: $12,707,813)

1. DOD DAMD-17-03-1-0713, $2,719,724, Orthopedic Implants Engineered to Prevent Post-Operative Infection of Open Fractures, Irving Shapiro, PI, Eric Wickstrom, co-investigator, 10% effort, 01 Dec 2003-30 Nov 2007, current year direct costs: $476,231
2. NIH 1 R01 CA109231-01, $1,940,296, PET Imaging of Breast Cancer Using Oncogene Expression, Mathew Thakur, PI, Eric Wickstrom, co-investigator, 10% effort, 1 Apr 2005-31 Mar 2009, current year direct costs: $253,111
3. NIH 1 R01 AR051303-01, $2,962,697, Smart Substrates for a New Generation of Implants, Irving Shapiro, PI, Eric Wickstrom, co-investigator, 9% effort, 22 Sep 2005-31 Jul 2009, first year direct costs: $436,886
4. NIH 1 U54 CA105008-04, $155,000, Magnetic Resonance and Near Infrared Imaging of *KRAS* mRNA, Eric Wickstrom, PL, 17% effort, subcontract from University of Pennsylvania, Network for Translational Research in Optical Imaging, Wafik El-Deiry, PI, 1 Sep 2006-31 Aug 2007, first year direct costs: $100,000
5. DOD BC053206, $7,000, Curcumin-nanotube preparation for breast cancer cell treatment, Eric Wickstrom, PL, 2% effort, subcontract from Geisinger Clinic, Curcumin-combretastatin nanocells as breast cancer cytotoxic and antiangiogenic agent, Anna Reeves, PI, 1 Sep 2006-31 Aug 2007, first year direct costs: $7,000
6. NIH 1 R24 CA83105-06, $30,000, Molecular Biology Core, Eric Wickstrom, Core Leader, 2% effort, subcontract from University of Pennsylvania, Small Animal Imaging Resource, Jerry Glickson, PI, 1 May 2007-30 June 2009, first year direct costs: $12,903

X. PENDING EXTRAMURAL RESEARCH GRANTS

1. Prostate Cancer Foundation, $100,000, PET Imaging of Cancer Gene Expression in Prostate Cancer, Mathew Thakur, PI, Eric Wickstrom, co-I, 10% effort, 1 July 2007-30 June 2008, first year direct costs: $100,000
2. DOD BC062014, $616,122, Sensing Circulating Breast Cancer Cells, Eric Wickstrom, PI, 13% effort, 1 Jul 2007-30 Jun 2009, first year direct costs: $250,000
3. DOD BC062173, $775,000, Breast Cancer Gene Activity PET Imaging, Eric Wickstrom, PI, 15% effort, 1 Jul 2007-30 Jun 2009, first year direct costs: $250,000
4. NIH 1 R01 CA132054, $1,318,133, Antisense Nanoparticle for Early Detection of Pancreatic Cancer by Magnetic Resonance Imaging, Eric Wickstrom, PL, 10% effort, subcontract from University of Delaware, Norman Wagner, PI, 1 Dec 2007-30 Nov 2012, first year direct costs: $154,983
5. NIH 1 R21 CA132057, $437,190, Antibody-Nanotube Device to Detect Breast Cancer Cells in Blood, Eric Wickstrom, PI, 15% effort, 1 Dec 2007-30 Nov 2012, first year direct costs: $135,468
6. NIH 1 R01 CA126808-01A1, $1,950,000, Oncogenic Approaches to PET Imaging of Prostate Cancer, Mathew Thakur, PI, Eric Wickstrom, co-I, 20% effort, 1 Dec 2007-30 Nov 2012, first year direct costs: $250,000
7. Leukemia and Lymphoma Society, $600,000, Radiohybridization Imaging and Therapy of Mantle Cell Lymphoma, Eric Wickstrom, PI, 10% effort, 1 Oct 2007-30 Sep 2010, first year direct costs: $180,000

XI. PLANNED EXTRAMURAL RESEARCH GRANTS

1. NIH 1 R01 CA??????-01, $1,592,310, Breast Cancer Stratification by Radiohybridization Imaging of Oncogene Activity, Eric Wickstrom, PI, 20% effort, 1 Apr 2008-31 Mar 2013, first year direct costs: $412,362
2. NIH 1 R01 ??????, $2,829,609, Polyurethane Bonding to Vancomycin and Bacitracin, Eric Wickstrom, PI, 20% effort, 1 Apr 2008-31 Mar 2013, first year direct costs: $340,851

3. NIH 1 R01 CA128900-01A1, $2,735,055, Radiohybridization Imaging of Oncogene Activity in Pancreas Cancer, Eric Wickstrom, PI, 25% effort, 1 Jul 2008-30 Jun 2013, first year direct costs: $332,362
4. NIH 1 R01 CA??????-01, $3,229,573, Imaging Colorectal Cancer Metastasis, Eric Wickstrom, PI, 20% effort, 1 Jul 2008-30 Jun 2013, first year direct costs: $397,602
5. NIH 1 R01 GM??????-01, $1,931,368, Functions of Zebrafish *chk1* and *ate1* Orthologs, Eric Wickstrom, PI, Hideko Kaji, co-PI, 20% effort, 1 Jul 2008-30 Jun 2013, first year direct costs: $250,000
6. NIH 1 R21 CA128380-01A1, $739,680, Comparison of MRI with mRNA Radioimaging for Determination of Breast Mass Malignancy, Eric Wickstrom, PI, 15% effort, 1 Jul 2008-30 Jun 2010, first year direct costs: $250,000
7. NIH 1 R21 CA??????-01, $739,680, Pilot Study of PET Imaging of *CCND1* mRNA in BIRADS 4/5 Breast Masses, Eric Wickstrom, PI, 15% effort, 1 Jul 2008-30 Jun 2010, first year direct costs: $250,000
8. NIH 1 R21 CA127763-01A1, $426,250, MRI and NIRF Hybridization Probes for Mutant *KRAS* mRNA in Pancreas Cancer, Eric Wickstrom, PI, 8% effort, 1 Jul 2008-30 Jun 2010, first year direct costs: $125,000

XII. PREVIOUS EXTRAMURAL RESEARCH GRANTS

1. DOE ER63055, $2,694,824, Oncogene mRNA Imaging with Radionuclide-PNA-Peptides, Eric Wickstrom, PI, Mathew Thakur, Co-Investigator, 15 Sep 2000-14 Dec 2006.
2. NIH N01-CO27175, $2,131,201, Radionuclide Imaging, Treatment, and Assessment of Cancer, Eric Wickstrom, PI, Mathew Thakur, Co-Investigator, 30 Sep 2002-30 Sep 2006
3. Panagenic International, Inc., $5,000, Homologous Recombination Between Exogenous DNA Fragments and the Genome of MCF7 Cells, 15 Dec 2003-22 Mar 2004
4. NIH R01 CA76290, $668,995, Site Specific Gene Insertion by Transposition, 1 Jan 1999-31 Dec 2003
5. NIH R01 CA42960, $2,473,651, Oligonucleotide Inhibition of Cell Proliferation, 1 Apr 1987-30 Jun 2003
6. NIH R03 TW01094, $116,094, Alkylating and Cleaving Anti-c-*MYC* DNAs for Breast Cancer, Eric Wickstrom, PI, Valentina Zarytova, Co-Investigator, 1 Jul 1999-30 Jun 2003
7. NIH S10 RR14770, $97,226, Jefferson Shared Circular Dichroism Facility, 1 Mar 2000-28 Feb 2001
8. NIH U01 CA60139, $3,050,509, Gene-Specific Therapy of Breast and Pancreatic Cancer, 1 Aug 1992-31 Dec 1996
9. Snow Brand Milk Products, $27,180, Synthesis and Pharmacokinetics of Antisense DNA, 1 Sep 1995-31 Aug 1996
10. American Cancer Society DHP-105, $200,000, Antisense DNA Therapy of *ras*-Induced Tumors in Immunocompromised Mice, 1 Jan 1994-31 Dec 1995
11. American Cancer Society RD-324, $75,000, Antisense DNA Therapy of *ras*-Induced Tumors in Nude Mice, 1 Aug 1990-31 Dec 1991
12. Genta, Inc., $64,000, Stereospecific Synthesis of Oligodeoxynucleoside Methylphosphonate Antisense Inhibitors, 1 Jul 1989-31 May 1990
13. American Foundation for AIDS Research 00638, $60,000, HIV *tat* Protein Interactions with mRNA TAR Sequence, 1 Jun 1988-30 Sep 1989
14. Florida High Technology and Industry Council, $139,108, Antisense Oligodeoxynucleoside Methylphosphonate Inhibition of Human Immunodeficiency Virus Gene Expression, 1 Apr 1988-28 Jan 1991
15. Biosearch, Inc., $50,900, Stereospecific Synthesis of All-S Oligodeoxynucleoside Methylphosphonates, 20 Jul 1987-31 Dec 1987
16. US Army Medical Research and Development Command DAMD17-86-G-6037, $157,939, Antisense Oligodeoxynucleotide Inhibition of AIDS Virus Gene Expression, 1 Oct 1986-31 Dec 1988
17. Leukemia Society of America, $50,000, Antisense Oligodeoxynucleotide Inhibition of Human c-*myc* Gene Expression, 1 Oct 1986-31 Dec 1987
18. NIH R01 GM32024, $254,163, IF3 Interactions with RNA Secondary Structure, 1 Jul 1986-30 Jun 1989
19. American Cancer Society, Florida Division, $12,000, Oligodeoxynucleotide Inhibition of Transformed Cell Proliferation, 1 Jun 1986-31 May 1987
20. American Foundation for AIDS Research 00004, $60,000, Antisense Oligodeoxynucleotide Inhibition of AIDS Virus *gag-pol* Gene Expression and Reverse Transcriptase Activity, 1 May 1986-30 Aug 1987

21. NIH RR01554, $70,000, Tampa Shared Circular Dichroism Facility, 1 Aug 1983-31 Jul 1984
22. NIH R01 GM28408, $45,431, Protein-Nucleic Acid Interactions of *Escherichia coli* Initiation Factor 3, 1 Feb 1981-31 Aug 1981
23. NIH GM27462, $52,350, Colorado Shared Circular Dichroism Facility, 30 Sep 1979-31 Aug 1981
24. NIH R01 GM24128, $177,591, Molecular Rulers for Ribosomes, 1 Jul 1978-30 Jun 1981
25. NSF BMS 75-17781, PCM 77-25211, and PCM 79-23471, $100,000, Molecular Rulers for Measuring RNA Structure, 1 Sep 1976-28 Feb 1981
26. NIH R01 GM23248, $69,096, Oligonucleotide Binding Specificity of *Escherichia coli* Initiation Factor 3, 1 Jun 1976-31 May 1978

XIII. CONFERENCE GRANTS

1. International Union of Biochemistry and Molecular Biology, $6,000; National Institutes of Health, $5,500; Rhône-Poulenc Rorer, $10,000; PE Biosystems, $2,200; Hybridon, $2,000; Glen Research, $2,000; Gene Tools, $2,000; Novartis, $2,000; Trilink Biotechnologies, $2,000; Amersham Pharmacia Biotech, $2,000; Berry Associates, $1,250; Inex, $1,324; Research Genetics, $1,000; Annovis, $1,000; Integrated DNA Laboratories, $1,000; Proligo, $1,000: Millennium Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida, 8-11 Jan 2000.
2. American Society for Pharmacology and Experimental Therapeutics, $3,000, Symposium on Antisense Oligonucleotides at the Clinical Threshold, Pharmacology 97 Meeting, San Diego, California, 7-11 Mar 1997.
3. National Institutes of Health, $6,000; International Union of Biochemistry, $5,000; Amgen, $5,000; Ciba-Geigy, $2,000; Du Pont, $2,000; Milligen/Biosearch, $2,000; PharmaGenics, $2,000; Rhône-Poulenc, $2,000; Enzo Biochem, $1,500; Synthecell, $1,450; Applied Biosystems, $1,000; Boehringer/Mannheim, $1,000; Genta, $1,000; Gilead, $1,000; Glaxo, $1,000; Hybridon, $1,000; ICI Pharmaceuticals, $500; Integrated DNA Technologies, $1,000; Institute for Biomolecular Science, $1,000; Isis, $1,000; Pfizer, $1,000; Sandoz, $1,000; Boron Biologicals, $500; Glen Research, $500; Life Sciences, $500; Midland Certified Reagents, $500; Research Genetics, $500; Synthetic Genetics, $500; Triplex, $500; Upjohn, $500; ICI Pharmaceuticals, $490: International Conference on Nucleic Acid Therapeutics, with co-PI Marvin Caruthers, Clearwater Beach, Florida, 13-17 Jan 1991.

XIV. PROFESSIONAL SOCIETIES, SERVICE, AND HONORS

Reviewer of Manuscripts for *Annals of Internal Medicine, Anti-Cancer Drug Design, Antisense and Nucleic Acid Drug Development, Archives of Biochemistry and Biophysics, Biochemical Pharmacology, Biochemistry, Bioconjugate Chemistry, Biomaterials, Bioorganic and Medicinal Chemistry Letters, Biopolymers, British Journal of Cancer, Cancer Communications, Cancer Research, Clinical Cancer Research, Experimental Cell Research, Journal of the American Chemical Society, Journal of Biochemical and Biophysical Methods, Journal of Cellular Biochemistry, Journal of Chromatography, Journal of Molecular Biology, Journal of the National Cancer Institute, Journal of Organic Chemistry, Journal of Pharmacology and Experimental Therapeutics, Journal of Virology, Molecular Cancer Therapeutics, Molecular and Cellular Biology, Molecular Medicine, Molecular Pharmacology, Nature, Nucleic Acids Research, Nucleosides Nucleotides and Nucleic Acids, Oligonucleotides, Organic Letters, Proceedings of the National Academy of Sciences USA, Science, Tetrahedron Letters*

2006-present: Cancer Research UK Ad Hoc Reviewer
2005-present: Member of the Oligonucleotide Therapeutics Society
2004: The Hip Society Frank Stinchfield Award for Titanium Surface with Biologic Activity Against Infection
2004-present: Editorial Board, *Biotechnology Healthcare*
2001-present: Food and Drug Administration Research Programs Ad Hoc Reviewer
2001-present: Department of Energy Ad Hoc Reviewer
2000: Organizer of the International Union of Biochemistry and Molecular Biology Millennium Conference on Nucleic Acid Therapeutics
1998-present: Member of the Joint Steering Committee for Public Policy
1998-present: Member of the National Institutes of Health Steering Committee for Therapeutic Oligonucleotides

1998-2002: Member, National Institutes of Health Experimental Therapeutics 1 Study Section
1997-present: Editorial Board, *Bioconjugate Chemistry*
1993-present: Army Breast Cancer Research Program Ad Hoc Reviewer
1992-present: American Cancer Society Ad Hoc Reviewer
1991-present: Member of the International Society for Nucleosides, Nucleotides, and Nucleic Acids
1991: Organizer of the International Union of Biochemistry Conference on Nucleic Acid Therapeutics
1990-2005: Editorial Board, *Oligonucleotides*
1989-present: National Institutes of Health Ad Hoc Reviewer
1988-present: Member of the American Association for Cancer Research
1986: Guest Researcher, Max Planck Institut für Molekulare Genetik, Berlin
1986: Guest Researcher, Clinical Pharmacology Branch, Clinical Oncology Program National Cancer Institute, Bethesda, Maryland
1984: European Molecular Biology Organization Fellow, Biochemisch Laboratorium, Rijksuniversiteit, Leiden, The Netherlands
1980-present: Member of the American Society for Biochemistry and Molecular Biology
1979-present: National Science Foundation Ad Hoc Reviewer
1973-present: Member of the American Chemical Society
1968-1971: National Science Foundation Fellow, University of California, Berkeley
1966-1968: Educational Opportunity Fund Scholar, Caltech
1965-1966: Gross Fund Scholar, Caltech

XV. TEACHING EXPERIENCE

A. Thomas Jefferson University
   1. Undergraduate: none
   2. Graduate: BI 515 Architectural Building Blocks; BI 522 Experimental Principles in Molecular Biology; BI 525 Genetic Information; BI 614 Protein Structure and Function; BI/PR 710,720,730 Biochemical/Pharmacological Literature Seminar; BT 411 Protein Purification and Characterization; GC 550 Foundations in Biomedical Sciences; GE 652 Molecular Basis of Cancer; PR 613 Structural Biology; TE 521 Tissue Engineering
   3. Residents: Radiation Oncology Residents Lectures "Radiobiologic Basis of Human Cancer"

B. University of South Florida
   1. Undergraduate: BCH 3023 Introductory Biochemistry; CHM 4970 Undergraduate Research
   2. Graduate: USF: BCH 5045 Biochemistry core course; BCH 6066 General Biochemistry I, Macromolecular Metabolism; BCH 6067 General Biochemistry II, Biophysical Chemistry; CHM 6973 Thesis Research; CHM 7820 Dissertation Research

C. University of Denver
   1. Undergraduate: 08-1.2 Introductory Chemistry; 08-6 Chemistry of Life; 08-10 General and Organic Chemistry for the Health Sciences; 08-11 Introductory Physiological Chemistry; 08-361 Introductory Physical Chemistry; 08-381 Biochemistry I and II; 08-382 Biochemistry Laboratory; Undergraduate Research
   2. Graduate: 08-390 Special Topics: Transcription; 08-390 Special Topics: Translation; 08-480 Physical Chemistry of Biopolymers; Graduate Research

XVI. UNIVERSITY, COLLEGE, AND DEPARTMENTAL COMMITTEES

2005-present: JMC Committee on Research
2005-present: Biochemistry and Molecular Biology PhD Program Committee
2005-present: KCC Seminar Committee
2005-present: TJU Strategic Planning Working Group on Cancer and Cancer Biology
2004-present: JMC Committee on Faculty Affairs
2002-present: KCC Structural Biology and Bioinformatics Committee
2000-present: KCC Circular Dichroism Facility Committee

1997-8: TJU Animal Resources Committee
1997-present: KCC Development Therapeutics Committee
1993-present: TJU Clinical Cancer Research Review Committee
1993-2002: KCC NMR Facility Committee
1993-7: KCC Computer Committee
1993-7: KCC Structural Biology Committee
1993-6: KCC Central Equipment Committee
1993-6: KCC Translational Research Committee
1991-2: USF Institute for Biomolecular Science Advisory Committee
1986-92: USF Biochemistry Division Coordinator
1985-7, 1990-2: USF Institutional Biosafety Committee
1985-92; USF Chemistry Graduate Council
1984-6: USF Radiation Safety Committee
1984-8: USF Institute of Molecular Biology and Biotechnology
1984-8: USF Natural Sciences Biotechnology Program Committee
1984-5, 1990-1: USF Biochemistry Search Committee
1983-4: USF Chemistry Seminar Committee
1978-80: DU Chemistry Graduate Committee
1978-80: DU Library Policy Committee (Chair, 1979-80)
1975-80: DU Radiation Safety Committee (Chair, 1978-80)
1975-7: DU Chemistry Undergraduate Committee
1974-5: DU Chemistry Seminar Chair

XVII. INVITED LECTURES

1. Positron emission, magnetic resonance, and near infrared hybridization imaging of *KRAS* mRNA in pancreas cancer xenografts. Network for Translational Research in Optical Imaging Retreat, Abramson Cancer Center, University of Pennsylvania, Philadelphia, Pennsylvania, 2007.
2. Design, synthesis, and testing of mRNA hybridization probes to detect cancer gene activation from outside the body, Department of Chemistry, Temple University, Philadelphia, Pennsylvania, 2007.
3. Imaging genetic markers of cellular proliferation *in vivo*, Cancer Diabetes Metabolism Seminar, Abramson Cancer Center, University of Pennsylvania, Philadelphia, Pennsylvania, 2007.
4. Molecular design of oncogene mRNA hybridization imaging probes, Department of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania, 2006.
5. SPECT, PET, and MR imaging of cancer gene mRNA in tumors. Department of Biochemistry, Temple University, Philadelphia, Pennsylvania, 2006.
6. Magnetic resonance and near infrared imaging of *KRAS* mRNA in pancreas cancer xenografts. Network for Translational Research in Optical Imaging Workshop, Cancer Imaging Program, National Cancer Institute, Bethesda, Maryland, 2006.
7. Single wall carbon nanotubes to detect or ablate breast cancer cells. Department of Electrical Engineering, University of Delaware, Newark, Delaware, 2006.
8. Receptor-mediated internalization of chelator-PNA-peptide hybridization probes for radioimaging or magnetic resonance imaging of oncogene mRNAs in tumors. Biochemical Society/Royal Society of Chemistry/Royal Pharmaceutical Society of Great Britain meeting on Cellular Delivery of Therapeutic Macromolecules, Cardiff University, Wales, 2006.
9. Imaging and targeting oncogene mRNA. Network for Translational Research in Optical Imaging Retreat, Abramson Cancer Center, University of Pennsylvania, Philadelphia, Pennsylvania, 2006.
10. Is the lump malignant or benign? PNA radioimaging of oncogene mRNAs in tumors. Frontiers in Peptide Nucleic Acid and Related Technologies Symposium, Carnegie Mellon University, Pittsburgh, Pennsylvania, 2006.
11. SPECT, PET, and MR imaging of *KRAS* oncogene mRNAs in pancreatic cancer xenografts. Department of Surgery, Thomas Jefferson University, Philadelphia, Pennsylvania, 2006.

12. Tumor diagnosis by SPECT and PET imaging of cancer gene mRNA. Penn Cancer Genetics Seminar, Department of Pediatrics, University of Pennsylvania, Philadelphia, Pennsylvania, 2005.
13. Imaging cancer gene mRNA in tumors. Distinguished Lecture in Macromolecular Therapeutics, Department of Pharmacology, University of North Carolina, Chapel Hill, North Carolina, 2005.
14. Gamma and positron imaging of oncogene mRNA inside tumors from outside the body with radionuclide-chelator-PNA-peptide chimeras. Department of Chemistry, Hunter College, City University of New York, New York, New York, 2005.
15. External imaging of oncogene mRNAs in tumors. Optical Imaging Retreat, Abramson Cancer Center, University of Pennsylvania, Philadelphia, Pennsylvania, 2005.
16. Noninvasive imaging of *KRAS* oncogene mRNAs in pancreatic cancer xenografts with [^{111}In]DOTA-dendrimer-PNA-peptide chimeras. Pancreas Cancer 2005: State-of-the-Art, Memorial Sloan-Kettering Cancer Center, New York, New York, 2005.
17. Radionuclide-chelator-PNA-peptides for imaging cancer gene mRNAs in tumors. Department of Chemical Engineering, University of Delaware, Newark, Delaware, 2005.
18. Hydroxyprolyl/phosphono peptide nucleic acid inhibition of *ccnd1* mRNA in developing zebrafish embryos: developmental consequences of cyclin D1 reduction. 1st International Symposium on Biomolecules and Related Compounds: Chemistry, Biology and Applications, Montpellier, France, 2005.
19. Noninvasive detection of oncogene overexpression by gamma and positron imaging of mRNA in tumors. Department of Radiation Oncology, University of Pennsylvania, Philadelphia, Pennsylvania, 2005.
20. External diagnosis of oncogene activation in tumors by radioimaging. Division of Hematology/Oncology, Department of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, 2004.
21. External imaging of *CCND1, MYC* and *KRAS* oncogene mRNAs with tumor-targeted radionuclide-PNA-peptide chimeras. International Conference on Tumor Progression and Therapeutic Resistance, Philadelphia, Pennsylvania, 2004.
22. Gamma and positron imaging of oncogene mRNA inside tumors from outside the body. Department of Radiology, University of Pennsylvania, Philadelphia, Pennsylvania, 2004.
23. Peptide-PNA-radionuclide chimeras for molecular diagnosis of cancer. DOE Gene Imaging Program, Chicago, Illinois, 2004.
24. Antisense nanoparticles for imaging, treatment, and assessment of pancreatic cancer gene expression. NASA/NCI Unconventional Innovations Program, San Diego, California, 2004.
25. Peptide-PNA-radionuclide chimeras for molecular diagnosis of cancer. 5th Cambridge Symposium on Nucleic Acids Chemistry and Biology, Queens' College, Cambridge, England, 2003.
26. Zebrafish embryonic gene knockdown with alternating hydroxyprolyl/phosphono peptide nucleic acids. Gordon Research Conference on Purines, Pyrimidines & Related Substances, Salve Regina University, Newport, Rhode Island, 2003.
27. Imaging oncogene expression. Sixth NIH Symposium on Therapeutic Oligonucleotides, National Cancer Institute, Bethesda, Maryland, 2002.
28. Down-regulation of zebrafish embryonic developmental genes with hydroxyprolyl/phosphono peptide nucleic acids. Therapeutic Oligonucleotide Interest Group, National Cancer Institute, Bethesda, Maryland, 2002.
29. Oligonucleotide conjugates for diagnosis and therapy of cancer. School of Pharmaceutical Sciences, Beijing University, China, 2002.
30. Genetic therapy with oligonucleotides. Department of Pathology and Laboratory Medicine, University of Medicine and Dentistry of New Jersey, Newark, New Jersey, 2002.
31. Imaging oncogene mRNA in mice with Tc-99m-peptide-PNA. Department of Energy Imaging Gene Expression Workshop II, Boston, Massachusetts, 2002.
32. Oncogene mRNA imaging with Tc-99m-PNA-peptides. International Conference on RNA as Therapeutic and Genomics Target, Novosibirsk Institute of Bioorganic Chemistry, Akademgorodok, Russia, 2001.
33. Oncogene mRNA imaging with Tc-99m-PNA-peptides. Fifth NIH Symposium on Therapeutic Oligonucleotides, National Cancer Institute, Bethesda, Maryland, 2000.
34. Oligonucleotide therapy for malignancies dependent on c-*MYC* or K-*RAS*. Department of Cancer Research, Merck Research Laboratories, West Point, Pennsylvania, 2000.

35. Nonviral site-specific gene insertion. Therapeutic Oligonucleotide Interest Group, National Cancer Institute, Bethesda, Maryland, 2000.
36. Site-specific gene insertion by transposition. Millennium Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida, 2000.
37. Genetic therapy with antisense DNA and DNA vectors. Department of Medicinal Chemistry, Virginia Commonwealth University, 1999.
38. Broad spectrum oligonucleotide therapy. University of Alabama, Birmingham, 1999.
39. Site specific cleavage of RNA by antisense DNA-bleomycin A_5 conjugate. Therapeutic Oligonucleotide Interest Group, National Cancer Institute, Bethesda, Maryland, 1999.
40. Genetic therapy with antisense DNA and DNA vectors. Institute for Gene Therapy, Mount Sinai School of Medicine, New York, New York, 1999.
41. Adjuvant antisense therapy for residual disease. Fourth NIH Symposium on Therapeutic Oligonucleotides, National Cancer Institute, Bethesda, Maryland, 1999.
42. Transposon Tn7 gene insertion into an evolutionarily conserved human homolog of *Escherichia coli* attTn7. Gordon Research Conference on Nucleic Acids, Salve Regina University, Newport, Rhode Island, 1999.
43. Oncogene c-*MYC* as a broad spectrum target for antisense DNA cancer therapy. IBC 6th International Symposium on Oligonucleotide Therapeutics, San Diego, California, 1999.
44. Broad spectrum oligonucleotide therapy. Epigenesis, Princeton, New Jersey, 1999.
45. Antisense and antigene DNA therapy. Department of Radiation Oncology, Thomas Jefferson University, Philadelphia, Pennsylvania, 1999.
46. Genetic therapy with oligonucleotides. Jefferson Center for Biomedical Research and Agricultural Medicine, Delaware Valley College, Doylestown, Pennsylvania, 1999.
47. Repressing pathogenic genes with therapeutic oligonucleotides. Department of Radiation Oncology, Thomas Jefferson University, Philadelphia, Pennsylvania, 1998.
48. Genetic therapy with antisense DNA. Aronex Pharmaceuticals, The Woodlands, Texas, 1998.
49. Assembly and behavior of stereoregular oligodeoxynucleoside methylphosphonates. Cambridge Healthtech Institute Conference on Oligonucleotide Synthesis, San Francisco, California, 1998.
50. PNA-peptide conjugates that direct nuclear localization. Cambridge Healthtech Institute Conference on Antisense Technologies, San Francisco, California, 1998.
51. Site-specific gene insertion by transposition. Kimeragen, Newtown, Pennsylvania, 1998.
52. Genetic therapy with antisense DNA and DNA vectors. Kimeragen, Newtown, Pennsylvania, 1998.
53. Oligonucleotide combination therapy to prevent murine lymphomagenesis. Oncology Frontiers Conference, Grand Cayman, British West Indies, 1997.
54. Cell specificity and backbone dependence of oligonucleotide uptake. Workshop on Future Needs and Developments in Antisense Technology, National Heart, Lung, and Blood Institute, Bethesda, Maryland, 1997.
55. Antisense oligonucleotides at the clinical threshold. American Society for Pharmacology and Experimental Therapeutics Symposium, Pharmacology 97 Meeting, San Diego, California, 1997.
56. Differential oligonucleotide activity in cell culture versus mouse models. Ciba Foundation Symposium No. 209, Oligonucleotides as Therapeutic Agents, London, England, 1997.
57. Genetic therapy with antisense DNA. College of Pharmacy, University of Minnesota, Minneapolis, Minnesota, 1997.
58. Oligonucleotide cancer therapy in animal models. Department of Pharmacology, University of Vermont, Burlington, Vermont, 1996.
59. Antisense inhibition of lymphoma growth. Department of Pharmacology, Pennsylvania State University Medical Center, Hershey, Pennsylvania, 1996.
60. Oligonucleotide therapy of murine B-cell lymphoma. Department of Pharmaceutics, Pharmacology, and Toxicology, Philadelphia College of Pharmacy and Science, Philadelphia, Pennsylvania, 1996.
61. Antisense c-*myc* inhibition of lymphoma growth. First NIH Symposium on Therapeutic Oligonucleotides, National Cancer Institute, Bethesda, Maryland, 1996.
62. Antisense DNA therapy in animal tumor models. BIO '96 International Biotechnology Meeting, Philadelphia, Pennsylvania, 1996.

63. Gene-targeted oligonucleotide therapy. Mid-Atlantic Pharmacology Society Annual Meeting, Pennsylvania State University Medical Center, Hershey, Pennsylvania, 1996.
64. Gene-specific therapy of breast and pancreatic cancer. Developmental Therapeutics Program, National Cancer Institute, Frederick, Maryland, 1996.
65. Cancer therapy with antisense DNA in animal models. Department of Pharmacology and Cell Biophysics, University of Cincinnati, Cincinnati, Ohio, 1996.
66. Stereospecific synthesis and hydrogen bond strength of antisense DNA methylphosphonates. Department of Chemistry, University of Pennsylvania, Philadelphia, Pennsylvania, 1995.
67. Prophylactic antisense DNA therapy of Eμ-*myc* transgenic mice. Vanderbilt Cancer Center, Vanderbilt University, Nashville, Tennessee, 1995.
68. Gene-specific cancer therapy with antisense DNA. Lombardi Cancer Center, Georgetown University Medical School, Washington, District of Columbia, 1995.
69. Antisense DNA cancer therapy. H. Lee Moffitt Cancer & Research Center, Tampa, Florida, 1995.
70. Prophylactic antisense DNA therapy of Eμ-*myc* transgenic mice. Centre Nationale de la Recherche Scientifique, Conférence Internationale, Les Oligonucléotides Therapeutiques de la Cellule a l'Homme, Seillac, France, 1995.
71. Antisense DNA therapy of Burkitt's lymphoma in transgenic mice. Department of Pediatrics, Children's Hospital of Pennsylvania, Philadelphia, Pennsylvania, 1995.
72. Gene-specific cancer therapy with antisense DNA in animal models. Department of Bioscience and Biotechnology, Drexel University, Philadelphia, Pennsylvania, 1994.
73. Stereospecific antisense DNA methylphosphonates for tumor therapy. First International Antisense Conference of Japan, Kyoto, Japan, 1994.
74. Stereochemistry and hybridization strength of antisense DNA methylphosphonates. Centre Nationale de la Recherche Scientifique, Conference Jacques Monod, Drugs Acting on Nucleic Acids, Aussois, France, 1994.
75. Targeting genes for antisense therapy. Human Genome Sciences, Rockville, Maryland, 1994.
76. Animal models for antisense DNA therapy of cancer. Department of Pharmacology, Memorial Sloan-Kettering Cancer Center, New York, New York, 1993.
77. Antisense DNA inhibition of oncogenes in mouse models. Department of Pharmacology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, 1993.
78. Gene-specific therapy of breast and pancreatic cancer. Third Anticancer Drug Discovery and Development Symposium, San Diego, California, 1993.
79. Down-regulation of oncogene expression in mice by antisense DNA therapy. Conference on Antisense Nucleic Acids, Max-Planck-Institut für Biophysikalische Chemie, Garmisch-Partenkirchen, Germany, 1993.
80. Animal models for antisense DNA therapy of cancer. International Conference on Nucleic Acid Medical Applications, Cancun, Mexico, 1993.
81. Nucleic acid therapeutics. Castle Group, New York, New York, 1993.
82. Antisense DNA therapy for cancer. Division of Hematology/Oncology, Duke University Medical Center, Durham, North Carolina, 1993.
83. Down-regulation of oncogene expression with antisense DNA therapeutics. Department of Chemistry, Bryn Mawr College, Bryn Mawr, Pennsylvania, 1992.
84. Animal models for antisense DNA therapy of cancer. Division of Biological Sciences, University of Montana, Missoula, Montana, 1992.
85. Animal models for antisense DNA therapy of cancer. Genta, Inc., San Diego, California, 1992.
86. Down-regulation of genes with antisense DNA: backbone effects. Gordon Research Conference on Biopolymers, Salve Regina University, Newport, Rhode Island, 1992.
87. Antisense DNA inhibition of c-Ha-*ras*-induced tumorigenesis in athymic nude mice. American Association for Cancer Research and American Society for Clinical Oncology Joint Annual Meeting, San Diego, California, 1992.
88. Animal models for antisense DNA therapy of cancer. Jefferson Cancer Institute, Thomas Jefferson University, Philadelphia, Pennsylvania, 1992.

89. Antisense DNA methylphosphonates in c-*myc* transgenic mice. International Symposium on Synthetic Oligonucleotides: Problems and Frontiers of Practical Application, Moscow, USSR, 1991.
90. Antisense DNA methylphosphonate inhibition of c-*myc* gene expression in transgenic mice. American Association for Cancer Research 82nd Annual Meeting, Houston, Texas, 1991.
91. Antisense DNA methylphosphonate inhibition of c-*myc* gene expression in transgenic mice. American Cancer Society, Florida Division, 14th Annual Seminar of Cancer Research, Orlando, Florida, 1991.
92. Stereochemistry of uncharged anti-oncogene DNA derivatives. Keystone Symposium on Gene Regulation by Antisense RNA and DNA, Frisco, Colorado, 1991.
93. Ablation of oncogene activity *in vitro* and *in vivo* by antisense DNA therapy. Center for Molecular Genetics, University of California, San Diego, 1991.
94. Down-regulation of oncogene expression with antisense DNA oligomers. Division of Medicinal Chemistry and Pharmaceutics, University of Kentucky, Lexington, Kentucky, 1990.
95. Steps in the development of antisense DNA therapeutics. Department of Chemistry, Georgia State University, Atlanta, Georgia, 1990.
96. Oncogene expression down-regulated by antisense DNA. Institutionen för Tumör Biologi, Karolinska Institutet, Stockholm, Sweden, 1990.
97. Stereospecific coupling reaction for methylphosphonothioate internucleotide linkage. Ninth International Roundtable on Nucleosides, Nucleotides, and Their Biological Applications, Uppsala, Sweden, 1990.
98. Antisense DNA. Gordon Research Conference on Nucleic Acids, Holderness School, New Hampton, New Hampshire, 1990.
99. Antisense DNA inhibition of *ras* oncogene expression. Suncoast Biotech Conference, St. Petersburg, Florida, 1990.
100. Target dependence of antisense oligodeoxynucleotide inhibition of c-Ha-*ras* p21 expression and focus formation in T24-transformed NIH3T3 cells. American Cancer Society, Florida Division, 13th Annual Cancer Research Seminar, Orlando, Florida, 1990.
101. Stereochemistry of uncharged anti-oncogene DNA derivatives. Department of Biochemistry and Molecular Biology, Harvard University, Cambridge, Massachusetts, 1990.
102. Synthesis of therapeutically useful antisense DNA derivatives. Interdisciplinary Center for Biotechnology Research, University of Florida, Gainesville, Florida, 1990.
103. Down-regulation of pathogenic gene expression by antisense DNA. Department of Pharmacology, University of Florida, Gainesville, Florida, 1990.
104. Antisense DNA therapeutics. Department of Physiology and Cellular Biophysics, Columbia University, New York, New York, 1990.
105. Down-regulation of pathogenic gene expression with synthetic antisense DNA. Department of Pathology, New York University Medical Center, New York, New York, 1990.
106. Antisense DNA inhibition of *ras* oncogene expression, and stereospecific synthesis of oligodeoxynucleoside methylphosphonates. Gilead Sciences, Inc., Foster City, California, 1989.
107. Down-regulation of oncogene and HIV gene expression with antisense DNA oligomers. Department of Biochemistry, University of Iowa, Iowa City, Iowa, 1989.
108. Antisense DNA inhibitors of oncogene and HIV gene expression: dependence on target sequence. Department of Biochemistry, Purdue University, West Lafayette, Indiana, 1989.
109. Varying efficiency of antisense inhibition at several targets in human c-*myc* mRNA. NATO/EEC Meeting on the Molecular Basis of Cell Growth Regulation, Mallorca, Spain, 1989.
110. Optimum targets for antisense inhibition in human c-*myc* mRNA. NCI/NIAID Conference on Oligodeoxynucleotides as Antisense Inhibitors of Gene Expression: Therapeutic Implications, Rockville, Maryland, 1989.
111. Selection of sensitive antisense targets in oncogene and viral mRNAs. American Red Cross, Rockville, Maryland, 1989.
112. Antisense DNA therapeutics. All Children's Hospital, Saint Petersburg, Florida, 1989.
113. Down-regulation of human c-*myc* oncogene and HIV *tat* gene expression by antisense oligodeoxynucleotides. Public Health Research Institute, New York, New York, 1989.

114. Efficacy of antisense oligodeoxynucleotides against oncogene and viral gene expression. Department of Molecular Genetics, Hoffmann-La Roche, Inc., Nutley, New Jersey, 1988.
115. Down-regulation of oncogenes and viral genes in transformed human cells by antisense oligodeoxynucleotides. International Workshop on Therapeutic and Diagnostic Applications of Oligonucleotide Derivatives, Novosibirsk Institute of Bioorganic Chemistry, Akademgorodok, USSR, 1988.
116. Antisense oligodeoxynucleotide inhibition of HIV gene expression. Workshop on Prophylaxis and Therapy of HIV Infections, Walter Reed Army Institute of Research, Washington, District of Columbia, 1988.
117. Antisense DNA inhibitors of gene expression. American Chemical Society, Florida Division, 41st Annual Meeting, Tampa, 1988.
118. Antisense DNA in c-*myc* gene regulation. Dimensions in Bioresearch, Milligen/Biosearch Fall Symposium Series, Durham, North Carolina, 1988.
119. Prospects for antisense DNA therapeutics. Dana-Farber Cancer Institute, Harvard Medical School, Boston, Massachusetts, 1988.
120. Antisense oligonucleotides as possible therapeutic agents. Department of Molecular Pharmacology, Smith, Kline, and French Laboratories, King of Prussia, Pennsylvania, 1988.
121. Use of antisense DNA oligomers as inhibitors of gene expression in cells. Department of Virology, Centers for Disease Control, Atlanta, Georgia, 1988.
122. Down regulation of oncogenes by antisense oligomers. Department of Biochemistry, New York Medical College, Valhalla, New York, 1988.
123. Antisense oligodeoxynucleotide inhibition of oncogenes in transformed human cells. EMBO/INSERM Workshop on Regulation of Gene Expression by RNA Structure and Anti-Messengers, Les Arcs, France, 1988.
124. Inhibition of human c-*myc* oncogene expression in normal and transformed cells by antisense oligodeoxynucleotides. Department of Microbiology and Immunology, State University of New York Health Sciences Center, Brooklyn, New York, 1987.
125. Antisense DNA therapeutics for hybrid arrest of oncogenes and human immunodeficiency virus genes. Eastman Pharmaceuticals, Inc., Great Valley, Pennsylvania, 1987.
126. Antisense DNA therapeutics for hybrid arrest of oncogenes and viral genes. Biosearch, Inc., San Rafael, California, 1987.
127. Potential DNA drugs for treatment of cancer and AIDS. Department of Natural Sciences, Eckerd College, St. Petersburg, Florida, 1987.
128. Sequence specific inhibition of promyelocytic leukemia cell and normal T lymphocyte proliferation by an anti-c-*myc* pentadecadeoxynucleotide. 10th Annual Cancer Research Seminar, American Cancer Society, Florida Division, Gainesville, 1987.
129. Exogenous antisense DNA probes of gene expression. Department of Biochemistry, University of South Florida School of Medicine, Tampa, Florida, 1987.
130. Antisense oligodeoxynucleotide inhibition of viral and oncogene expression. Molecular Therapeutics, Inc., West Haven, Connecticut, 1987.
131. Exogenous antisense DNA probes of gene expression. Department of Molecular Genetics and Microbiology, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, Piscataway, New Jersey, 1987.
132. Sequence specific inhibition of promyelocytic leukemia cell and normal T lymphocyte proliferation by an anti-c-*myc* pentadecadeoxynucleotide. Biochemical Society and Royal Society of Chemistry Meeting on Therapeutic and Diagnostic Applications of Synthetic Nucleic Acids, Cambridge, England, 1987.
133. Thermodynamic prediction of targets for antisense DNA therapeutics. Department of Physics, University of South Florida, Tampa, Florida, 1986.
134. *Escherichia coli* 16S RNA cloacin fragment helix destabilization by initiation factor 3 protein: mechanism, sites, and strength of interaction. Clinical Pharmacology Branch, National Cancer Institute, Bethesda, Maryland, 1986.
135. Hybridization arrest of translation of eukaryotic mRNAs with antisense pentadecadeoxynucleotide targeted against loops in predicted mRNA secondary structures. Clinical Oncology Program, National Cancer Institute, Bethesda, Maryland, 1986.

136. *Escherichia coli* translational initiation factor 3 interactions with RNA secondary structure. Institutionen för Molekylär Biologi, Uppsala Universitets, Uppsala, Sweden, 1985.
137. Spectroscopic studies of the interaction of *Escherichia coli* translational initiation factor 3 protein with the 16S ribosomal RNA 3' cloacin fragment. Max Planck Institut für Molekulare Genetik, Berlin, Germany, 1985.
138. Oligonucleotide inhibition of gene expression. Department of Chemistry, Florida Atlantic University, Boca Raton, Florida, 1985.
139. Initiation factor 3 protein interactions with the 3' end of 16S RNA. Department of Biochemistry, University of South Florida College of Medicine, Tampa, Florida, 1984.
140. Therapeutic oligonucleotides. New Technology Assessment Group, Pennwalt Corporation, King of Prussia, Pennsylvania, 1984.
141. Messenger RNA binding to ribosomes: the role of initiation factor 3. Department of Zoology and Physiology, Rutgers University, Newark, New Jersey, 1983.
142. Physical chemistry and specificity of ribonucleic acid binding to protein synthesis initiation factor 3. Department of Chemistry, University of South Florida, Tampa, Florida, 1983.
143. Circular dichroism, nuclease mapping and crosslinking studies of ribosome structure and function. Department of Chemistry, California State University, San Jose, California, 1983.
144. The role of initiation factor 3 in messenger RNA binding to ribosomes: interactions with the 3' end of 16S ribosomal RNA. Creative Biomolecules, Inc., South San Francisco, California, 1983.
145. Crosslinking and circular dichroism probes of RNA structure and function. Department of Biochemistry, University of Nebraska College of Medicine, Omaha, Nebraska, 1982.
146. Protein-nucleic acid interactions of IF3, and molecular rulers for biological macromolecules. Wistar Institute of Anatomy and Biology, Philadelphia, Pennsylvania, 1982.
147. Molecular rulers for biological macromolecules. Department of Chemistry, University of South Florida, Tampa, Florida, 1981.
148. Molecular rulers for biological macromolecules. Department of Chemistry, Brooklyn College, City University of New York, Brooklyn, New York, 1981.
149. Physical parameters of *E. coli* IF3 binding to poly(A). Department of Biochemistry, New York Medical College, Valhalla, New York, 1981.
150. Protein-nucleic acid interactions of *E. coli* initiation factor 3. Department of Biochemistry, University of Mississippi Medical Center, Jackson, Mississippi, 1981.
151. Protein-nucleic acid interactions of *E. coli* initiation factor 3. Cetus Corporation, Berkeley, California, 1980.
152. Protein-nucleic acid interactions of *E. coli* initiation factor 3. La Jolla Cancer Research Foundation, La Jolla, California, 1980.
153. Molecular rulers for measuring RNA structure. Division of Chemistry and Chemical Engineering, California Institute of Technology, Pasadena, California, 1980.
154. Protein-nucleic acid interactions of *E. coli* initiation factor 3. Department of Organic Chemistry, Genentech, Inc., South San Francisco, California, 1980.
155. Rigid, variable-length oligoproline crosslinking reagents for measuring tRNA structure. Department of Biochemistry, University of California, Berkeley, California, 1978.
156. Progress toward developing molecular rulers for measuring RNA structure. Department of Chemistry, Brookhaven National Laboratory, Upton, New York, 1975.
157. Effect of AUG on the stability of RNA hairpin loops, and binding to IF3. Chemistry Board of Studies, University of California, Santa Cruz, California, 1974.

XVIII. CONFERENCE ABSTRACTS

1. Cesarone, G., Edupuganti O.P., Chen, C., Wickstrom, E. (2007) Insulin receptor substrate 1 knockdown by nuclease resistant siRNA conjugated to cholesterol or a disulfide-bridged D-peptide analog of insulin-like growth factor 1 in human MCF7 breast cancer cells. American Association for Cancer Research 98th Annual Meeting, Los Angeles, California.
2. Dimitrov, I., Amirkhanov, N., Zhang, K., Aruva, M. R., Lai, S., Thakur, M. L., and Wickstrom, E. (2007) $(Gd\text{-}DOTA)_2$-*KRAS* PNA-peptide MRI contrast enhancement in AsPC1 pancreatic xenografts. Cancer detection in

mice using dendrimeric Gd-peptide nucleic acid-peptide molecular probes. International Society for Magnetic Resonance in Medicine 15th Annual Meeting, Berlin, Germany

3. Zhang, K., Aruva, M. R., Shanthly, N., Cardi, C. A., Wickstrom, E., and Thakur, M. L. (2007) Role of IGF1R in PET hybridization imaging of ER-positive human breast cancer xenografts using ^{64}Cu-PNA. Society of Nuclear Medicine 54th Annual Meeting, Washington DC.
4. Antoci, V., Jr., Adams, C.S., Parvizi, J., King, S.B., Wickstrom, E., Zeiger, A. R., Composto, R. J., Ducheyne, P,, Shapiro, I. M., Hickok, N. J. (2006) Antibiotic modified implant surface is stable, microbicidal, osteocompatible. Eastern Orthopaedic Association Annual Meeting, Boca Raton, Florida, October 18-21 2006.
5. Antoci, V., Jr., Adams, C.S., Parvizi, J., King, S.B., Wickstrom, E., Zeiger, A. R., Composto, R. J., Ducheyne, P,, Shapiro, I. M., Hickok, N. J. (2006) Covalently attached vancomycin in engineering a new implant with antibacterial properties. Infectious Disease Society of America Annual Meeting, Toronto, Canada.
6. Antoci, V., Jr., Adams, C.S., Parvizi, J., King, S.B., Wickstrom, E., Zeiger, A. R., Composto, R. J., Ducheyne, P,, Shapiro, I. M., Hickok, N. J. (2006) Antibiotics intrinsic to implants provide hope. International Society for Technology in Arthroplasty Annual Meeting, New York City, New York.
7. Antoci, V., Jr., Adams, C.S., Hoffsommer, HM, Jose, B, King, S.B., Freeman, TA, Parvizi, J., Shapiro, I. M., Wickstrom, E., Hickok, N. J. (2006) Vancomycin-modified rods inhibit bacteria even after serum coating. International Society for Technology in Arthroplasty Annual Meeting, New York City, New York.
8. Antoci, V., Jr., Parvizi, J., Freeman, TA, Hoffsommer, HM, Wickstrom, E., Zeiger, A. R., Shapiro, I. M., Hickok, N. J., Adams, CS. (2006) Vancomycin-modified implant inhibits bacterial surface colonization and infection development. International Society for Technology in Arthroplasty Annual Meeting, New York, New York.
9. Antoci, V., Jr., Hickok, N. J., Parvizi, J., Freeman, TA, Composto, R. J., Saunders, R, Zeiger, A. R., Wickstrom, E., Ducheyne, P,, Shapiro, I. M., Adams, CS. (2006) Antibiotic integral to implant surface inhibits bacterial, but not osteoblast colonization. American Society of Bone and Mineral Research Annual Meeting, Philadelphia, Pennsylvania.
10. Antoci, V., Jr., Adams, C.S., Parvizi, J., King, S.B., Wickstrom, E., Zeiger, A. R., Composto, R. J., Ducheyne, P,, Shapiro, I. M., Hickok, N. J. (2006) Covalently attached vancomycin provides a nanoscale antibacterial surface. Musculoskeletal Infection Society Annual Meeting, Olympic Valley, California.
11. Antoci, V., Jr., Adams, C.S., Hoffsommer, HM, Binoy, J., King, S.B., Freeman, TA, Parvizi, J., Shapiro, I. M., Hickok, N. J. Vancomycin-modified rods inhibit bacteria despite serum coverage. Musculoskeletal Infection Society Annual Meeting, Olympic Valley, California.
12. Antoci, V., Jr., Parvizi, J., Freeman, TA, Hoffsommer, HM, Wickstrom, E., Zeiger, A. R., Shapiro, I. M., Hickok, N. J., Adams, CS. (2006) Vancomycin-modified surface effective against peri-prosthetic infection. Musculoskeletal Infection Society Annual Meeting, Olympic Valley, California.
13. Antoci, V., Jr., Hickok, N. J., Adams, C.S., Parvizi, J., Wickstrom, E., Zeiger, A. R., Composto, R. J., Ducheyne, P,, Shapiro, IM. (2006) Smart substrates for a new generation of implants. NIH Bioengineering Consortium 6th Annual Bioengineering Research Partnership Annual Meeting. Bethesda, Maryland.
14. Chakrabarti, A., Amirkhanov, N., Zhang, K., Aruva, M. R., Cardi, C. A., Thakur, M. L., and Wickstrom, E. (2006) Positron imaging of pancreas cancer using Cu-64-DOTA-PNA-peptide chimera. Optical Imaging Retreat: Progress & Clinical Translation of In Vivo Imaging, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania.
15. Amirkhanov, N., Zhang, K., Aruva, M. R., Dimitrov, I., Lai S., Thakur, M. L., and Wickstrom, E. (2006). Noninvasive magnetic resonance imaging of *KRAS* oncogene mRNA expression in pancreas cancer xenografts. Optical Imaging Retreat: Progress & Clinical Translation of In Vivo Imaging, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania.
16. Chakrabarti, A., Zhang, K., Aruva, M. R., Cardi, C. A., Thakur, M. L. and Wickstrom, E. (2006) Activated *KRAS* mRNA detected in pancreas cancer xenografts by PET imaging of ^{64}Cu-DOTA-peptide nucleic acid-peptide chimeras. Society of Nuclear Medicine 53rd Annual Meeting, San Diego, California.
17. Zhang, K., Aruva, M. R., Shanthly, N., Rattan, S., Patel, C., Cesarone, G., Wickstrom, E., and Thakur, M. L. (2006) Cu-64-peptide PET imaging of VPAC1 oncogene product in breast tumors. Society of Nuclear Medicine 53rd Annual Meeting, San Diego, California.

18. Chakrabarti, A., Amirkhanov, N., Zhang, K., Aruva, M. R., Cardi, C. A., Thakur, M. L., and Wickstrom, E. (2006). Activated *KRAS* mRNA detected in pancreas cancer xenografts by PET imaging of Cu-64-DOTA-peptide nucleic acid-peptide chimeras. University of Pennsylvania School of Medicine Center for Molecular Studies in Digestive and Liver Diseases 7th Annual Conference and Retreat on Advances in GI cancers: animal models to proteomics, Philadelphia, Pennsylvania.
19. Amirkhanov, N., Dimitrov, I., Zhang, K., Aruva, M. R., Lai, S., Thakur, M. L., and Wickstrom, E. (2006) $(Gd\text{-}DOTA)_2$-*KRAS* PNA-peptide MRI contrast enhancement in AsPC1 pancreatic xenografts. American Association for Cancer Research 97th Annual Meeting, Washington, DC.
20. Hickok, N. J., Powell, D. K., Antoci, V., Jr., Jose, B., Parvizi, J., Zeiger, A. R., Shapiro, I. M., Wickstrom, E., and Adams, C. S. (2006) Delivery of doxorubicin by titanium implants. Orthopaedic Research Society 52nd Annual Meeting, Chicago, Illinois.
21. Antoci, V., Jr., Jose, B., King, S. B., Parvizi, J., Zeiger, A. R., Shapiro, I. M., Adams, C. S., Wickstrom, E., and Hickok, N. J. (2006) Covalent modification of implants with antibiotics: a new paradigm. Orthopaedic Research Society 52nd Annual Meeting, Chicago, Illinois.
22. Parvizi, J., Antoci, V., Jr., King, S. B., Jose, B., Hickok, N. J., Zeiger, A. R., Wickstrom, E., Shapiro, I. M., and Adams, C. S. (2006) Vancomycin covalently bonded to titanium alloy prevents *S. aureus* colonization. Orthopaedic Research Society 52nd Annual Meeting, Chicago, Illinois.
23. Adams, C. S., Antoci, V., Jr., Hoffsommer, H. M., Jose, B., King, S. B., Freeman, T. A., Parvizi, J., Shapiro, I. M., Wickstrom, E., and Hickok, N. J. (2006) Serum-coated vancomycin-modified Ti prevents *S. epidermidis* biofilm formation. Orthopaedic Research Society 52nd Annual Meeting, Chicago, Illinois.
24. Antoci V Jr., King S.B., Parvizi J., Adams CS, Jose B, Wickstrom E., Shapiro IM, and Hickok NJ. (2006) Vancomycin Tethered to Ti Rods Prevents *S. aureus* Infection. American Academy of Orthopaedic Surgeons 73rd Annual Meeting, Chicago, Illinois.
25. Aruva, M.R., Tian, X., Zhang, K., Mathew, B., Shantly, N., Cardi, C., Wickstrom, E., and Thakur, M. L. (2005) Imaging oncogene expression in breast cancer with receptor specific peptides and peptide nucleic acids. IAEA International Symposium on Trends in Radiopharmaceuticals, Vienna, Austria.
26. Cesarone, G., Garofalo, C., Igoucheva, O., Alexeev, V., Yoon, K., Surmacz, E., and Wickstrom, E. (2005) RNA interference with insulin receptor substrate 1 (IRS-1) expression in MCF7 cells enhances tamoxifen-mediated cell death. International Conference on the Role of the IGF System in Cancer, Universita di Catania, Taormina, Italy.
27. Duffy, K. T., Davidson, W., McAleer, M. F., Kari, G., Farber, S. A., Dicker, A., Rodeck, U., and Wickstrom, E. (2005) Radiation sensitization of zebrafish by phosphono-PNA knockdown of *ccnd1* mRNA. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
28. Tian, X., Aruva, M.R., Zhang, K., Mathew, B., Cardi, C., Thakur, M. L., and Wickstrom, E. (2005) *In vivo* PET imaging of *CCND1* mRNA in human ER+ breast cancer xenografts with Cu-64-DOTA-PNA-peptide chimeras. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
29. Wyre, D. S., Abrams, M. T., and Wickstrom, E. (2005) Elevation of glucocorticoid sensitivity in acute lymphoblastic leukemia cells by siRNA against *BCL2*. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
30. Amirkhanov, N., Aruva, M. R., Zhang, K., Mathew, B., Thakur, M. L. and Wickstrom, E. (2005) $([^{111}In]DOTA)_{16}$-dendrimer-PNA-peptide imaging of *KRAS* mRNA in tumors. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
31. Cesarone, G., Garofalo, C., Igoucheva, O., Alexeev, V., Yoon, K., Surmacz, E., and Wickstrom, E. (2005) RNA interference with insulin receptor substrate 1 (IRS-1) expression in MCF7 cells enhances tamoxifen-mediated cell death. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
32. Chakrabarti, A., Aruva, M. R., Zhang, K., Mathew, B., Fong, D.T., Thakur, M. L. and Wickstrom, E., (2005) PET and scintigraphic imaging of *KRAS* mRNA in pancreas cancer. 1st Annual Meeting of the Oligonucleotide Therapeutics Society, New York, New York.
33. Amirkhanov, N., Aruva, M. R., Zhang, K., Mathew, B., Thakur, M. L. and Wickstrom, E. (2005) In-111- and Gd-157-DOTA-polydiamidopropanoate (PDAP) dendrimer-PNA-peptide chimeras for noninvasive imaging of

intracellular oncogene mRNA expression. 1st International Conference on Chemical Biology, Institute of Chemical Biology and Fundamental Medicine, Novosibirsk, Russia.

34. Antoci, V., King, S., Parvizi, J., Adams, C., Jose, B., Wickstrom, E., Zeiger, A., Shapiro, I., and Hickok, N. (2005) Vancomycin tethered to Ti rods prevents *S. aureus* biofilm formation. Eastern Orthopaedic Association 36th Annual Meeting, Chesapeake, Maryland.
35. Amirkhanov, N., Aruva, M. R., Zhang, K., Mathew, B., Thakur, M. L. and Wickstrom, E. (2005) Design, synthesis, and evaluation of chelator-dendrimer-peptide nucleic acid-peptide chimeras for non-invasive magnetic resonance imaging (MRI) of intracellular messenger RNA and oncogene expression. Gordon Research Conference on Nucleosides, Nucleotides, and Oligonucleotides, Salve Regina University, Newport, Rhode Island.
36. Zhang, K., Aruva, M. R., Mathew, B., Chakrabarti, A., Wickstrom, E., and Thakur, M. L. (2005) PET imaging of pancreatic cancer using Cu-64 labeled DOTA-PNA-peptide chimera. 16th International Symposium on Radiopharmaceutical Chemistry, Iowa City, Iowa.
37. Amirkhanov, N., Aruva, M. R., Zhang, K., Mathew, B., Thakur, M. L. and Wickstrom, E. (2005) Synthesis and evaluation of In-111 DOTA-polydiamidopropanoate (PDAP) dendrimer-PNA-peptide chimeras for non-invasive imaging of cancer. 16th International Symposium on Radiopharmaceutical Chemistry, Iowa City, Iowa.
38. Chakrabarti, A., Aruva, M. R., Zhang, K., Mathew, B., Fong, D.T., Thakur, M. L. and Wickstrom, E., (2005) External imaging of oncogene *KRAS* mRNA overexpression in pancreatic cancer xenografts with Tc-99m and Cu-64 chelator PNA-peptide chimeras. Society of Nuclear Medicine 52nd Annual Meeting, Toronto, Canada.
39. Teker, K., Sivakumar, K., Wickstrom, E., and Panchapakesan, B. (2005) Electronic sensing of antibodies using carbon nanotube devices. 2005 Nano Science and Technology Institute Nanotechnology Conference, Anaheim, California.
40. Jose, B., King, S. J., Zeiger, A. R., Adams, C. J., Hickok, N., and Wickstrom, E. (2005) Solid phase synthesis of vancomycin-bis(8-amido-3,6-dioxaoctanoyl)-amidopropylsiloxy-titanium implants that inhibit proliferation of *Staphylococcus aureus*. 15th Biennial Philadelphia Organic Chemists' Club Day, Philadelphia, Pennsylvania.
41. Amirkhanov, N., Aruva, M. R., Zhang, K., Mathew, B., Thakur, M. L., and Wickstrom, E. (2005) In-111 and Gd-157 DOTA-polydiamidopropanoate (PDAP) dendrimer-PNA-peptide chimeras for non-invasive imaging of cancer. American Association for Cancer Research 96th Annual Meeting, Anaheim, California.
42. Chakrabarti, A., Aruva, M. R., Sajankila, S.P., Thakur, M. L., and Wickstrom, E. (2005) Tc-99m and Cu-64 PNA-peptide hybridization probes for imaging of oncogene activation in pancreatic cancer. American Association for Cancer Research 96th Annual Meeting, Anaheim, California.
43. Jose, B., King, S. J., Zeiger, A. R., Hickok, N. J., and Wickstrom, E. (2005) Solid phase synthesis of vancomycin-bis(8-amido-3,6-dioxaoctanoyl)-amidopropylsiloxy-titanium implants that inhibit proliferation of *Staphylococcus aureus*. American Chemical Society 229th National Meeting, San Diego, California.
44. Neuman, B., Hickok, N. J., Adams, C.S., Jose, B., and Wickstrom, E. (2005) The effect of Arg-Gly-Asp-Ser (RGDS) on osteosarcoma cell attachment to titanium alloy. Sigma Xi Society Meeting, Thomas Jefferson University, Philadelphia, Pennsylvania.
45. Cesarone, G., Garofalo, C., Igoucheva, O., Alexeev, V., Yoon, K., Surmacz, E., and Wickstrom, E. (2005) Specific reduction of insulin receptor substrate 1 (IRS-1) expression in MCF7 cells by RNA interference. Sigma Xi Society Meeting, Thomas Jefferson University, Philadelphia, Pennsylvania.
46. Tian, X., Aruva, M., Qin, W., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2004) External imaging of *CCND1* and *MYC* oncogene mRNAs in ER+ breast cancer xenografts with tumor-targeted ^{99m}Tc-PNA-peptide chimeras. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.
47. Chakrabarti, A., Aruva, M., Zhang, K., Mathew, B., Thakur, M. L., and Wickstrom, E. (2004) Gamma and positron imaging of *KRAS* oncogene mRNA inside pancreatic cancer xenografts from outside the body with radionuclide-PNA-peptides. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.
48. Amirkhanov, N., Aruva, M. R., Sajankila, S. P., Lai, S., Thakur, M. L., and Wickstrom, E. (2004) Synthesis of gadolinium-DOTA-dendrimer-PNA-peptide contrast agents for magnetic resonance imaging of *KRAS* oncogene mRNA. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.

49. Abrams, M. T., Robertson, N. M., Yoon, K., and Wickstrom, E. (2004) Inhibition of glucocorticoid-induced apoptosis by targeting the major splice variants of *BIM* mRNA with siRNA and shRNA. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.
50. Cesarone, G., Garofalo, C., Igoucheva, O., Alexeev, V., Yoon, K., Surmacz, E., and Wickstrom, E. (2004) Specific reduction of insulin receptor substrate 1 (IRS-1) expression in MCF7 cells by RNA interference. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.
51. Duffy, K. T., McAleer, M. F., Choob, M., Kari, L., Kari, C., Archdeacon, J., Farber, S. A., Dicker, A., Rodeck, U., and Wickstrom, E. (2004) Consequences of cyclin D1 reduction in developing zebrafish embryos injected with hydroxyprolyl/phosphono peptide nucleic acid oligomers targeted to ccnd1 mRNA. Seventh NIH Symposium on Therapeutic Oligonucleotides, Bethesda, Maryland.
52. Parvizi, J., Wickstrom, E., Zeiger, A. R., Adams, C.S., Shapiro, I. M., Purtill, J. J., Sharkey, P. F., Hozack, W. J., Rothman, R. H. and Hickok, N. J. (2004) Self-protective titanium surface. American Association of Hip and Knee Surgeons, Dallas, Texas.
53. Parvizi, J., Wickstrom, E., Zeiger, A. R., Adams, C.S., Shapiro, I. M., Purtill, J. J., Sharkey, P. F., Hozack, W. J., Rothman, R. H. and Hickok, N. J. (2004) Titanium surface with biologic activity against infection. Combined Orthopedic Research Societies, Banff, Canada.
54. Amirkhanov, N., Aruva, M. R., Sajankila, S. P., Lai, S., Thakur, M. L., and Wickstrom, E. (2004) Gadolinium-DOTA-dendrimer-PNA-peptide chimeras for MRI of mRNA in pancreatic cancer. XVI International Roundtable on Nucleosides, Nucleotides, and Nucleic Acids, Minneapolis, Minnesota.
55. Tian, X., Aruva, M. R., Qin, W., Sajankila, S. P., Thakur, M. L., and Wickstrom, E. (2004) Tumor-targeting peptide-PNA-peptide chimeras for imaging overexpressed oncogene mRNAs. XVI International Roundtable on Nucleosides, Nucleotides, and Nucleic Acids, Minneapolis, Minnesota.
56. Chakrabarti, A., Aruva, M. R., Sajankila, S. P., Thakur, M. L., and Wickstrom, E. (2004) Synthesis of chelator-PNA-peptide chimera for non-invasive imaging of cancer. XVI International Roundtable on Nucleosides, Nucleotides, and Nucleic Acids, Minneapolis, Minnesota.
57. Parvizi, J., Wickstrom, E., Zeiger, A. R., Adams, C.S., Shapiro, I.M., Purtill, J. J., Sharkey, P. F., Hozack, W. J., Rothman, R. H. and Hickok, N. J. (2004) Titanium surface with biologic activity against infection. Musculoskeletal Infection Society Annual Meeting, Pittsburgh, Pennsylvania.
58. Tian, X., Aruva, M., Qin, W., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2004) Synthesis of radiolabeled and fluorescent tumor-targeting PNA-peptide chimeras for imaging overexpressed oncogene mRNAs. Third Annual Meeting of the Society for Molecular Imaging, St. Louis, Missouri.
59. Tian, X., Aruva, M., Qin, W., Zhu, W., Duffy, K. T., Sauter, E. R., Thakur, M. L., and Wickstrom, E. (2004) Preparation and evaluation of Tc-99m-peptide-PNA-peptide chimeras and imaging of *CCND1* mRNA expression in human breast cancer xenografts. Society of Nuclear Medicine 51st Annual Meeting, Philadelphia, Pennsylvania.
60. Thakur, M. L., Aruva, M. R., Gariepy, J., Acton, P., Rattan, S., Wickstrom, E., and Alavi, A. (2004) PET imaging of VPAC1 oncogene overexpression using Cu-64-vasoactive intestinal peptide (VIP). Society of Nuclear Medicine 51st Annual Meeting, Philadelphia, Pennsylvania.
61. Duffy, K. T., Farber, S. A., and Wickstrom, E. (2004) Zebrafish developmental defects and transcriptional perturbation following cyclin D1 knockdown. American Association for Cancer Research 95th Annual Meeting, Orlando, Florida.
62. Cesarone, G., Garofalo, C., Eva Surmacz, E., and Wickstrom, E. (2004) Specific reduction of insulin receptor substrate 1 (IRS-1) expression in MCF7 cells by RNA interference. American Association for Cancer Research 95th Annual Meeting, Orlando, Florida.
63. Abrams, M., Robertson, N., Litwack, G., and Wickstrom, E. (2004) Modulation of glucocorticoid sensitivity by RNA interference in leukemic cells. American Association for Cancer Research 95th Annual Meeting, Orlando, Florida.
64. Parvizi, J., Wickstrom, E., Zeiger, A. R., Adams, C.S., Shapiro, I. M., Purtill, J. J., Sharkey, P. F., Hozack, W. J., Rothman, R. H. and Hickok, N. J. (2004) Titanium surface with biologic activity against infection. American Academy of Orthopaedic Surgeons, 71th Annual Meeting, San Francisco, California.

65. Wickstrom, E., Urtishak, K. A., Choob, M., Tian, X., and Farber, S. A. (2003) Zebrafish embryonic gene knockdown with alternating hydroxyprolyl/phosphono peptide nucleic acids. 5th Cambridge Symposium on Nucleic Acids Chemistry and Biology, Queens' College, Cambridge, England.
66. Thakur, M. L., Tian, X., Aruva, M., Qin, W., Duffy, K., Rao, P. S., Sauter, E. R., and Wickstrom, E. (2003) Imaging oncogene mRNA with Tc-99m-PNA-peptide chimeras. 15th International Symposium on Radiopharmaceutical Chemistry, Sydney, Australia.
67. Amirkhanov, N., Chakrabarti, A., Thakur, M. L., and Wickstrom, E. (2003) Oligonucleotide-radionuclide conjugates for molecular diagnosis and therapy of cancer. NASA/NCI Unconventional Innovations Program, Chicago, Illinois.
68. Chakrabarti, A., Desai, P., and Wickstrom, E. (2003) Transposon Tn7 protein TnsD affinity for eukaryotic DNA target sequences enables nonviral site-specific gene insertion. Gordon Research Conference on Purines and Pyrimidines, Salve Regina University, Newport, Rhode Island.
69. Tian, X., Wickstrom, E. (2003) Continuous solid-phase synthesis and disulfide cyclization of peptide-PNA-peptide conjugates labeled with fluorescein. Gordon Research Conference on Purines, Pyrimidines & Related Substances, Salve Regina University, Newport, Rhode Island.
70. Chakrabarti, A., Desai, P., and Wickstrom, E. (2002) Transposon Tn7 protein TnsD affinity for eukaryotic DNA target sequences enables nonviral site-specific gene insertion. Conference on Cancer Gene Therapy, Sidney Kimmel Cancer Center, La Jolla, California.
71. Chakrabarti, A., Desai, P., and Wickstrom, E. (2002) Tn7 - A tool for site-specific transposition into mammalian DNA. Fall Mid-Atlantic Transposition Meeting, National Cancer Institute, Frederick, Maryland.
72. Thakur, M. L., Sauter, E. R., Rao, P. S., Zhu, W., Tian, X., Qin, W., and Wickstrom, E. (2002) ^{99m}Tc-PNA-peptides: Imaging oncogene expression in breast lesions. Society of Nuclear Medicine 49th Annual Meeting, San Francisco, California.
73. Urtishak, K. A., Choob, M. V., Wickstrom, E., and Farber, S. A. (2002) Targeted gene disruption of zebrafish chordin, notail, and uroD: A comparison of morpholinos and modified peptide nucleic acids. Fifth International Conference on Zebrafish Development & Genetics, Madison, Wisconsin.
74. Urtishak, K. A., Wickstrom, E., and Farber, S. A. (2002) Modified peptide nucleic acids: an alternative to morpholinos for targeted gene disruption in zebrafish larvae. Society for Developmental Biology, Mid-Atlantic Regional Meeting, Washington DC.
75. Rao, P. S., Tian, X., Qin, W., Thakur, M. L., Sauter, E. R., and Wickstrom, E. (2002) Imaging oncogene expression in breast tumors with Tc-99m-PNA-peptides. American Association for Cancer Research 93rd Annual Meeting, San Francisco, California.
76. Sauter, E. R., Rao, P. S., Tian, X., Qin, W., Thakur, M. L., and Wickstrom, E. (2002) Imaging oncogene expression in breast tumors with Tc-99m-PNA-peptides. American Association for Cancer Research Special Conference on Molecular Imaging in Cancer, Lake Buena Vista, Florida.
77. Thakur, M. L., Wickstrom, E., Tian, X., Rao, P. S., Qin, W., and Sauter, E. R. (2001) Tc-99m-chelator-PNA-peptides for imaging oncogene mRNA. DOE and NIH Conference on Imaging in 2020, Jackson Hole, Wyoming.
78. Vorobjev, P. E., Pyshnaya, I. A., Novopashina, D., Venyaminova, A. G., Wickstrom, E., and Zarytova, V. F. (2001) Cleavage of RNA within bulged complexes by bleomycin A5 conjugated to oligonucleotides. International Conference on RNA as Therapeutic and Genomics Target, Novosibirsk Institute of Bioorganic Chemistry, Akademgorodok, Russia.
79. Tian, X., Wickstrom, E., Rao, P. S., Thakur, M. L., Qin, W., and Sauter, E. R. (2001) Oncogene mRNA imaging with Tc-99m-PNA-peptide conjugates. Gordon Research Conference on Purines and Pyrimidines, Salve Regina University, Newport, Rhode Island.
80. Chakrabarti, A., Cleaver, S.H., and Wickstrom, E. (2001) Site specific gene insertion by transposition. Gordon Research Conference on Nucleic Acids, Salve Regina University, Newport, Rhode Island.
81. Yakubov, L. A., Shestova, O. E., Andreeva, A. Y., Wickstrom, E., and Vlassov, V. V. (2000) Oligonucleotide-cell surface protein complexes trafficking into cell nuclei. Millennium Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida.

82. Smith, J. B., Vorobjev, P. E., Zarytova, V. F., and Wickstrom, E. (1999) Site specific cleavage of RNA by antisense DNA-bleomycin A_5 conjugate. American Association for Cancer Research Annual Meeting, Philadelphia, Pennsylvania.
83. Smith, J. B., and Wickstrom, E. (1998) Anti-c-*myc* and immunostimulatory oligonucleotide inhibition of tumorigenesis in a murine B-cell lymphoma transplant model. Nature Biotechnology Conference on Antisense 98, London, England.
84. Smith, J. B., and Wickstrom, E. (1998) Anti-c-*myc* and immunostimulatory oligonucleotide inhibition of tumorigenesis in a murine B-cell lymphoma transplant model. Cambridge Healthtech Institute Conference on Antisense Technologies, San Francisco, California.
85. Smith, J. B., and Wickstrom, E. (1997) Inhibition of tumorigenesis in a murine B-cell lymphoma transplant model by c-*myc* complementary oligonucleotides. Third European Conference on Gene Therapy of Cancer, Humboldt University, Berlin, Germany.
86. Cleaver, S., and Wickstrom, E. (1997) Tn7 transposition into a human sequence. American Society for Biochemistry and Molecular Biology Annual Meeting, San Francisco, California.
87. Wickstrom, E., and Smith, J. B. (1997) Inhibition of tumorigenesis in a murine B-cell lymphoma transplant model by c-*myc* complementary oligonucleotides. Nature Biotechnology Conference on Antisense 97: Targeting the Molecular Basis of Disease, Cambridge, Massachusetts.
88. Smith, J. B., and Wickstrom, E. (1997) Inhibition of tumorigenesis in a murine B-cell lymphoma transplant model by c-*myc* complementary oligonucleotides. American Association for Cancer Research Annual Meeting, San Diego, California.
89. Fu, Z. F., Wickstrom, E., Yang, J., Dietzschold, B., and Koprowski, H. (1996) Inhibition of rabies virus infection *in vitro* and *in vivo*. VII Annual International Meeting: Advances Towards Rabies Control in the Americas, Atlanta, Georgia.
90. Gray, G. D., Townsend, R., Hayasaka, H., Korngold, R., and Wickstrom, E. (1996) Immune cell involvement in anti-c-*myc* DNA prevention of tumor formation in a mouse model of Burkitt's lymphoma. XII International Roundtable on Nucleosides, Nucleotides, and Their Biological Applications, San Diego, California.
91. Fu, Z. F., Wickstrom, E., Dietzschold, B., and Koprowski, H. (1996) Oligonucleotides complementary to rabies virus genomic RNA inhibits rabies virus infection. American Society for Virology 15th Annual Meeting, London, Ontario, Canada.
92. Basu, S., and Wickstrom, E. (1996) Tetraplex formation by phosphorothioate oligodeoxynucleotide sequences used in antisense experiments targeted to c-*myc* and *c-myb* mRNA. American Society for Biochemistry and Molecular Biology Annual Meeting, New Orleans, Louisiana.
93. Basu, S., and Wickstrom, E. (1996) An efficient method of improving the cellular uptake of peptide nucleic acids. American Society for Pharmacology and Experimental Therapeutics Annual Meeting, Washington DC.
94. Peritz, A. E., Germann, M. W., and Wickstrom, E. (1996) ^{1}H NMR studies on a DNA-RNA octamer duplex. Structural Biology Symposium, Sealy Center for Structural Biology, University of Texas Medical Branch, Galveston, Texas.
95. DeLong, R. K., Nolting, A., Fisher, M., Kligshteyn, M., Wickstrom, E., Demirdji, S., Caruthers, M. H., and Juliano, R. L. (1995) Pharmacokinetics of antisense oligonucleotide analogs in tumor bearing nude mice. American Association of Pharmaceutical Scientists Annual Meeting, Miami, Florida.
96. Basu, S., Kolan, H. R., Thakur, M. L., and Wickstrom, E. (1995) Solid phase synthesis of a HYNIC-D-peptide-phosphorothioate oligodeoxynucleotide conjugate from two arms of a polyethylene glycol-polystyrene support. 11th International Symposium on Radiopharmaceutical Chemistry, Vancouver, Canada
97. Cleaver, S., and Wickstrom, E. (1995) Molecular modeling of the topoisomerase I DNA binding site. American Society for Biochemistry and Molecular Biology Annual Meeting, San Francisco, California.
98. Thakur, M. L., Wickstrom, E., John, E., John, C. S., and Chiotellis, E. (1995) Preparation of Tc-99m-antisense and distribution in normal mice. Society of Nuclear Medicine 42nd Annual Meeting, Minneapolis, Minnesota.
99. Huang, Y., Snyder, R., Kligshteyn, M., and Wickstrom, E. (1995) Prevention of B-cell lymphoma in Eμ-*myc* transgenic mice by six weeks of treatment with anti-c-*myc* DNA phosphorothioate. Federation of American Societies for Experimental Biology Annual Meeting, Atlanta, Georgia.

100. Huang, Y., Snyder, R., Kligshteyn, M., and Wickstrom, E. (1995) Prevention of B-cell lymphoma in Eμ-*myc* transgenic mice by six weeks of treatment with anti-c-*myc* DNA phosphorothioate. American Association for Cancer Research Annual Meeting, Toronto, Ontario, Canada.
101. Gray, G. D., and Wickstrom, E. (1995) Cellular uptake of modified antisense DNAs, Miami Winter Bio/Technology Symposium, Miami, Florida.
102. Le Bec, C., and Wickstrom, E. (1994) Stereospecific coupling for synthesis of oligodeoxynucleoside methylphosphonates in liquid phase. Eleventh International Roundtable on Nucleosides, Nucleotides, and Their Biological Applications, Leuven, Belgium.
103. Basu, S., and Wickstrom, E. (1994) Synthesis of synthetic peptide-oligodeoxynucleotide conjugate. 16th International Union of Biochemistry and Molecular Biology Congress, New Delhi, India.
104. Wickstrom, E., Huang, Y., Gray, G., and Kligshteyn, M. (1994) Antisense DNA administration in c-*myc* transgenic mice and in nude mice bearing c-Ha-*ras* induced tumors. American Society for Biochemistry and Molecular Biology Annual Meeting, Washington, District of Columbia.
105. Tyson, F. L., Otstot, J. T., Anna, C. H., Kligshteyn, M., Wickstrom, E., and Anderson, M. W. (1994) Proliferative responses of human pancreatic tumor cells to methylphosphonate antisense Ki-*ras* oligodeoxynucleotides. American Association for Cancer Research Annual Meeting, San Francisco, California.
106. Wickstrom, E., Gray, G., Huang, Y., and Kligshteyn, M. (1994) Antisense DNA administration by subcutaneous cholesterol pellets in c-*myc* transgenic mice and in nude mice bearing c-Ha-*ras* induced tumors. American Association for Cancer Research Annual Meeting, San Francisco, California.
107. Vyazovkina, K. V., Rife, J. P., Lebedev, A. V., and Wickstrom, E. (1993) Preparation of trimers and tetramers of mixed sequence oligodeoxynucleoside methylphosphonates and assignment of configurations at the chiral phosphorus. International Conference on Nucleic Acid Medical Applications, Cancun, Mexico.
108. Wickstrom, E., Gray, G., Hebel, D., Hernandez, O., O'Kelly, K., and Pow-Sang, J. M. (1992) Antisense DNA inhibition of c-Ha-*ras*-induced tumorigenesis in athymic nude mice. American Urological Association, Annual Meeting, Washington, DC.
109. Wickstrom, E., Gray, G., Hebel, D., Hernandez, O., O'Kelly, K., and Pow-Sang, J. M. (1992) Antisense DNA inhibition of c-Ha-*ras*-induced tumorigenesis in athymic nude mice. American Urological Association, Southeastern Division Meeting, Charlotte, North Carolina.
110. Gray, G., Hebel, D., Hernandez, O., Pow-Sang, J. M., and Wickstrom, E. (1992) Antisense DNA inhibition of c-Ha-*ras*-induced tumorigenesis in athymic nude mice. American Cancer Society, Florida Division, 15th Annual Seminar of Cancer Research, Orlando, Florida.
111. Wickstrom, E., Gray, G., Hebel, D., and Pow-Sang, J. M. (1992) Antisense DNA inhibition of c-Ha-*ras*-induced tumorigenesis in athymic nude mice. American Society for Biochemistry and Molecular Biology and Biophysical Society Joint Annual Meeting, Houston, Texas.
112. Wickstrom, E., Sandgren, E., Bacon, T. A., Wickstrom, E. L., Werking, C., and Brinster, R. L. (1991) Antisense DNA methylphosphonate inhibition of c-*myc* gene expression in transgenic mice. Federation of American Societies for Experimental Biology Annual Meeting, Atlanta, Georgia.
113. Looney, D. J., Ojwang, J. O., Harper, M. E., Wickstrom, E., and Wong-Staal, F. (1991) Inhibition of HIV-1 by deoxyribonucleotides directed against regulatory gene messages and response elements. Keystone Symposium on Gene Regulation by Antisense RNA and DNA, Frisco, Colorado.
114. Farese, R. V., Ishizuka, T., Standaert, M., Wickstrom, E., and Cooper, D. R. (1991) Effects of insulin on phospholipid metabolism, diacylglycerol-protein kinase c signaling, and its relationship to glucose transport in rat adipocytes. Keystone Symposium on the Adipose Cell: A Model for Integration of Hormone Signaling in the Regulation of Cellular Function, Park City, Utah.
115. Standaert, M., Wickstrom, E., Yu, B. Z., Sasse, J., Hernandez, H., Cooper, D. R., and Farese, R. (1991) Protein Kinase C (PKC) Antisense DNA and (PKC) 19-31 pseudosubstrate inhibit 2-deoxyglucose uptake in rat adipocytes. Keystone Symposium on The Adipose Cell: A Model for Integration of Hormone Signaling in the Regulation of Cellular Function, Park City, Utah.
116. Wickstrom, E., Bacon, T. A., Wickstrom, E. L., Werking, C., Brinster, R. L., and Sandgren, E. (1991) Antisense DNA methylphosphonate inhibition of c-*myc* gene expression in transgenic mice. International Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida.

117. Rife, J. P., Bulychev, N. V., Zektzer, A. S., and Wickstrom, E. (1991) 2-D NMR ROESY analysis of Tr-TpT-Ac methylphosphonothioate. International Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida.
118. Kinniburgh, A. J., Davis-Smyth, T. L., Baer, M., Augustinos, P., and Wickstrom, E. (1991) An H-DNA-forming, c-*myc* promoter element is a target for anti-proliferative oligonucleotides. International Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida.
119. Farese, R. V., Ishizuka, T., Standaert, M., Wickstrom, E., and Cooper, D. R. (1991) Effects of insulin on phospholipid metabolism, diacylglycerol-protein kinase C signaling, and its relationship to glucose transport in rat adipocytes. International Conference on Nucleic Acid Therapeutics, Clearwater Beach, Florida.
120. Ho, P. T. C., Bacon, T. A., Wickstrom, E., and Sartorelli, A. C. (1990) Efficacy of antisense phosphodiester and phosphorothioate oligodeoxynucleotides to the transferrin receptor correlates with serum stability and cellular uptake. American Society for Cell Biology Annual Meeting, Houston, Texas.
121. Muralikrishna, P., and Wickstrom, E. (1989) Overexpression of *E. coli* IF3: transcriptional control and interactions with the conserved central region of 16S rRNA in 30S ribosomal subunits. Cold Spring Harbor Laboratory Meeting on Translational Control, Cold Spring Harbor, New York.
122. Wickstrom, E., Bacon, T. A., and Daaka, Y. (1989) selection of sensitive antisense targets in oncogene and HIV mRNAs. Cold Spring Harbor Laboratory Meeting on Translational Control, Cold Spring Harbor, New York.
123. Muralikrishna, P., and Wickstrom, E. (1989) Interactions of *E. coli* IF3 with the conserved central region of 16S rRNA in 30S ribosomal subunits. American Society for Microbiology Conference on Ribosomes, Glacier National Park, Montana.
124. Wickstrom, E. (1989) Antisense DNA inhibitors of HIV. Florida High Technology and Industry Council Workshop on the Future of Health Technologies in Florida, Miami, Florida.
125. Bacon, T. A., Gonzalez, A., and Wickstrom, E. (1989) Optimum targets for antisense inhibition in human c-*myc* mRNA. American Cancer Society, Florida Division, 12th Annual Cancer Research Seminar, Orlando, Florida.
126. Wickstrom, E., Bacon, T. A., and Gonzalez, A. (1989) Walking along human c-*myc* mRNA with antisense DNA oligomers. American Society for Biochemistry and Molecular Biology and American Society for Cell Biology Joint Meeting, San Francisco, California.
127. Cook, R. M., Hudson, D., Zou, A.-Q., Teplow, D. B., Wong, H., Tsou, D., and Wickstrom, E. (1988) FMOC mediated solid phase assembly of HIV *tat*-III protein. 20th European Peptide Symposium, Tübingen, West Germany.
128. Wickstrom, E. (1988) Antisense DNA inhibitors of gene expression. Gordon Research Conference on Nucleic Acids, New Hampton School, New Hampton, New Hampshire.
129. Muralikrishna, P., and Wickstrom, E. (1988) *Escherichia coli* initiation factor 3 protein binding to 30S ribosomal subunits alters the accessibility of nucleotides within the conserved central region of 16S rRNA. Gordon Research Conference on Biopolymers, Holderness School, Plymouth, New Hampshire.
130. Bacon, T. A., and Wickstrom, E. (1988) Differentiation of HL-60 leukemic cells induced by antisense DNA. First Annual USF Growth Factors Seminar, Tampa.
131. Israel, J., Norton, D. R., Wenzinger, G. R., and Wickstrom, E. (1988) Synthesis and separation of diastereomers of 5'-O-dimethoxytrityl thymidine methylphosphonyl thymidine 3'-O-acetate. American Chemical Society, Florida Division, 41st Annual Meeting, Tampa.
132. Bacon, T. A., Gonzalez, A., Mahovich, K., and Wickstrom, E. (1988) Antisense oligodeoxynucleotide inhibition of c-*myc* antigen expression in human promyelocytic leukemia cells. Leukemia Society of America Fourth National Symposium, New Orleans.
133. Bacon, T. A., Gonzalez, A., Mahovich, K., and Wickstrom, E. (1988) Antisense oligodeoxynucleotide inhibition of c-*myc* antigen expression in human promyelocytic leukemia cells. American Cancer Society, Florida Division, 11th Annual Cancer Research Seminar, Tampa.
134. Wickstrom, E., Laing, L. G., Brombach, M., Pon, C. L., Gualerzi, C. O., Paci, M., Boelens, R., and Kaptein, R. (1987) 2D NMR and CD studies of *Escherichia coli* initiation factor 3 tertiary structure. Ninth International Biophysics Congress, Jerusalem.

135. Wickstrom, E., Laing, L. G., Brombach, M., Pon, C. L., Gualerzi, C. O., Paci, M., Boelens, R., and Kaptein, R. (1987) 2D NMR and CD studies of *Escherichia coli* initiation factor 3 tertiary structure. American Society of Biological Chemists 78th Annual Meeting, Philadelphia.
136. Wickstrom, E., Wickstrom, E. L., Heikkila, R., Schwab, G., Pluznik, D., Lyman, G. H., Freeman, D. L., Watt, R., and Neckers, L. M. (1987) Sequence specific inhibition of promyelocytic leukemia cell and normal T lymphocyte proliferation by an anti-c-*myc* pentadecadeoxynucleotide. European Molecular Biology Laboratory Conference on Oncogenes and Growth Control, Heidelberg.
137. Neckers, L. M., Schwab, G., Wickstrom, E., Pluznik, D., and Heikkila, R. (1987) Role of c-*myc* in lymphocyte mitogenesis: studies with an antisense oligonucleotide. Federation of American Societies for Experimental Biology 71st Annual Meeting, Washington, 2488.
138. Neckers, L. M., Schwab, G., Wickstrom, E., Pluznik, D., and Heikkila, R. (1987) Role of c-*myc* in lymphocyte mitogenesis: studies with an antisense oligonucleotide. Schering-UCLA Symposium on Recent Advances in Leukemia and Lymphoma, Keystone, Colorado.
139. Wickstrom, E. L., Wickstrom, E., Lyman, G. H., and Freeman, D. L. (1986) HL60 cell proliferation inhibited by an anti-c-*myc* pentadecadeoxynucleotide. American Society of Biological Chemists 77th Annual Meeting, Washington.
140. Wickstrom, E. L., Wickstrom, E., Lyman, G. H., and Freeman, D. L. (1986) HL60 cell proliferation inhibited by an anti-c-*myc* pentadecadeoxynucleotide. Leukemia Society of America Second Annual Medical Conference, Saddlebrook Resort, Wesley Chapel, Florida.
141. Wickstrom, E., Simonet, W. S., Medlock, K., and Ruiz-Robles, I. (1985) Complementary oligonucleotide probes of vesicular stomatitis virus matrix protein mRNA secondary structure. Fifth Biophysical Discussions, Airlie House, Virginia.
142. Wickstrom, E., Simonet, W. S., Medlock, K., and Ruiz-Robles, I. (1985) Complementary oligonucleotide probes of vesicular stomatitis virus matrix protein mRNA secondary structure. 13th International Congress of Biochemistry, Amsterdam.
143. Wickstrom, E., Simonet, W. S., Medlock, K., and Ruiz-Robles, I. (1985) Complementary oligonucleotide probes of vesicular stomatitis virus matrix protein mRNA secondary structure. NATO Advanced Research Workshop on Three Dimensional Structure and Dynamics of RNA, Renesse, The Netherlands.
144. Heus, H. A., van Knippenberg, P. H., Haasnoot, C. A. G., Hilbers, C. W., and Wickstrom, E. (1985) Structural and functional aspects of a conserved stem-loop structure in 16S ribosomal RNA. NATO Advanced Research Workshop on Three Dimensional Structure and Dynamics of RNA, Renesse, The Netherlands.
145. Wickstrom, E., Heus, H. A., van Knippenberg, P. H., Haasnoot, C. A. G., and Hilbers, C. W. (1985) 500 MHz proton magnetic resonance studies of the interaction of *Escherichia coli* translational initiation factor 3 protein with the 16S ribosomal RNA 3' cloacin fragment. International Conference on the Structure, Function, and Genetics of Ribosomes, Port Aransas, Texas.
146. Wickstrom, E., Simonet, S., and Ruiz-Robles, I. (1985) Oligonucleotide inhibition of gene expression. American Cancer Society, Florida Division, 8th Annual Cancer Research Seminar, Tampa, A27.
147. Wickstrom, E., Simonet, S., and Ruiz-Robles, I. (1985) Oligonucleotide inhibition of gene expression. Centre Nationale de la Recherche Scientifique, Colloque en Oligonucléotides et Génétique Moléculaire, Aussois, France, B29.
148. Wickstrom, E. (1984) Circular dichroism of the 16S RNA cloacin fragment: titration by IF3. Eighth International Biophysics Congress, Bristol, England.
149. Wickstrom, E. (1983) Nuclease mapping of *Escherichia coli* initiation factor 3 interactions with the 49-nucleotide 3' terminal fragment of 16S RNA. Biophysical Society 27th Annual Meeting, San Diego, M-AM-K10.
150. Wickstrom, E. (1982) Predicting efficient ribosome binding sites. Gordon Research Conference on Biopolymers, Holderness School, Plymouth, New Hampshire.
151. Wickstrom, E., and Parker, K. K. (1981) Molecular rulers for ribosomes: chlorambucilyl oligoprolyl phenylalanyl-tRNA crosslinking to 50S ribosomal proteins and 5S RNA. European Molecular Biology Organization Symposium on Ribosome Structure and Function, Heidelberg, West Germany.

152. Wickstrom, E., Wickstrom, L. J., and Tyson, R. W. (1981) Physical parameters of *E. coli* initiation factor 3 binding to poly(A). Biophysical Society 25th Annual Meeting, Denver, T-PM-A10.
153. Wickstrom, E. (1980) Polynucleotide and oligonucleotide secondary structure alteration by *Escherichia coli* translational initiation factor 3. Gordon Research Conference on Biopolymers, Holderness School, Plymouth, New Hampshire.
154. Wickstrom, E., Mischke, C. F., Reuben, M. A., Ainpour, P. R., Kusnezov, I. J., Simmons, M. A., Hatlelid-Hester, H. L., and Neveln, V. L. (1979) Synthesis, intramolecular crosslinking kinetics, and sites of crosslinking of chlorambucilyl oligoprolyl [^{3}H]phenylalanyl-tRNA^{Phe} (yeast). American Chemical Society 178th National Meeting, Washington, Biol. 125.
155. Wickstrom, E., Schleich, T. W., Tyson, R. W., and Twombly, K. (1979) Polynucleotide and oligonucleotide secondary structure alteration by *Escherichia coli* initiation factor 3, in the presence and absence of ribosomal protein S1. American Chemical Society 178th National Meeting, Washington, Biol. 124.
156. Ainpour, P. R., and Wickstrom, E. (1978) Modifications of solid phase synthesis to obtain homogeneous oligoprolines in high yield. American Chemical Society 4th Rocky Mountain Regional Meeting, Boulder, 116.
157. Reuben, M. A., and Wickstrom E. (1978) Solvent and pH dependence of phenylalanyl-tRNA deacylation and N-hydroxysuccinimide ester modification. American Chemical Society 4th Rocky Mountain Regional Meeting, Boulder, 126.
158. Mischke, C. F., and Wickstrom, E. (1978) Separation and quantitation of regular and modified nucleosides in 80 min. by cation-exchange HPLC, and in 40 min. by reversed-phase HPLC. American Chemical Society 4th Rocky Mountain Regional Meeting, Boulder, 124.
159. Wickstrom, E., and Ainpour, P. R. (1976) Breakdown of oligoproline during HBr cleavage from a polystyrene resin. American Society of Biological Chemists 67th Annual Meeting, San Francisco, 483.
160. Wickstrom, E., and Yarus, M. J. (1975) Alkylation of the TΨC loop of tRNA^{Ile} (*E. coli*). American Chemical Society 170th National Meeting, Chicago, Biol. 127.